

V. *On the Crustacea Isopoda of the 'Lightning,' 'Porcupine,' and 'Valorous' Expeditions. By the Rev. A. M. NORMAN, M.A., D.C.L., F.L.S., and the Rev. T. R. R. STEBBING, M.A.*

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[PLATES XVI. to XXVII.]

Part I.—APSEUDIDÆ, TANAIDÆ, ANTHURIDÆ.

CONSIDERING the few hauls which have as yet been taken with the dredge at depths greater than 1000 fathoms in the North Atlantic, it is surprising that by far the larger number of families of the Isopodous Crustacea are already known to have their representatives at this excessive depth, while many more were taken in the British expeditions at such lesser though still great depths as a few years ago were almost unassayed.

The families which we now know to descend below 1000 fathoms are:—

Apseudidæ . . . . .	Genera <i>Apsedes, Sphyrapus,</i>
Tanaidæ . . . . .	Many genera,
Anthuridæ . . . . .	Many genera,
Anceidæ . . . . .	<i>Anceus,</i>
Cymothoidæ . . . . .	<i>Cirolana,</i>
Idotheidæ . . . . .	<i>Chiridothea,</i>
Asellidæ . . . . .	<i>Nannoniscus,</i>
Munnidæ . . . . .	<i>Ischnosoma, Macrostylis,</i>
Munnopsidæ . . . . .	<i>Munnopsis, Ilyarachna, Eurycope;</i>

and in the Southern Sea the Serolidæ were found by the 'Challenger' over a wide area, descending even to 2040 fathoms.

Apart, perhaps, from the Serolidæ, the most interesting of the abyssal Isopoda are those belonging to the families Munnidæ and Munnopsidæ. These are furnished with antennæ and legs of extraordinary length and delicacy of structure; and, unfortunately, the free use of sieves in washing the ooze on board the British expeditions resulted in the entire mutilation of such specimens as were picked out from them, so that they were for the most part little more than mere memberless trunks.

We shall adopt in the following paper, as far as Tribes and Families are concerned, the arrangement of the Isopoda which has recently been used by that prince among

carcinologists, Prof. G. O. Sars, in his recent Catalogue<sup>1</sup> of the higher Crustacea of Norway. The arrangement appears to us more natural in some particulars than those which have preceded it.

### Subclass ISOPODA.

#### Tribe I. *CHELIFERA*, G. O. Sars.

Animal narrow, subdepressed, or subcylindrical, but never compressed.

Head united with the first or, more rarely, with the first and second segments of the peræon, so as to form a short carapace, the surface of which is often areolated with lines of depression. The following segments of the peræon are always distinct, and are often separated by deep constrictions.

The pleon is composed of six segments, the first five of which are usually distinct (but in some cases coalesced into a single segment), and furnished with pleopods, which consist of a basal joint and two unjointed branches (but in those cases where the segments are coalesced, and sometimes otherwise, the pleopods are undeveloped). The last segment is formed by the union of the two last segments of the pleon, and is much larger than the preceding, and carries the uropods.

The eyes, when present, are situated on triangular lobes, at the anterior angles of the carapace.

The upper antennæ are furnished with either one or two flagella.

The lower antennæ are smaller than the upper, and are placed below them. In the genus *Apseudes* they have an articulated antennal scale at the end of the second joint.

The mandibles vary greatly in structure, and sometimes have, and at others have not, a palp.

The first maxillæ have a backward-directed palp, which assists in causing currents of water to pass through the branchial chamber, which is situated under the hinder part of the carapace.

The second maxillæ are developed and setose, or rudimentary and naked.

The maxillipeds are large, with a four-jointed palp, and also a large, membranous, backward-directed branchial palp, which passes into the branchial chamber.

The first gnathopods are largely developed, smaller in the female, but sometimes in the male of great size, chelate.

The second gnathopods in the *Apseudidæ* are largely developed, with flattened wrist and hand, margined with strong spines, so as to form a most efficient burrowing-instrument; but in the *Tanaidæ* they are narrow and slender, and adapted for progression.

The peræopods are formed for walking; the two first pair are directed backwards,

<sup>1</sup> G. O. Sars, 'Oversigt af Norges Crustaceer med foreløbige Bemærkninger over de nye eller mindre bekjendte Arter,' 1882.

the last three forwards. Their minute microscopic structure is very varied, since they are furnished with setæ and spines of every kind of complex structure, so that they will be found in their minute armature to afford very reliable specific characters.

Uropods setaceous, consisting of a basal joint and one or two filamentary branches which vary greatly in length.

Respiration by means of a branchial chamber, which is situated beneath the sides of the hinder portion of the carapace. Heart occupying the earlier segments of the peræon. Eggs carried in a pouch beneath the body, which is formed of thin plates, which may either spring from the fourth free segment alone, or consist of four pairs attached to four segments.

*Synopsis of the Families of Chelifera.*

Upper antennæ with two flagella. Second maxillæ well developed and setose.

Second gnathopods with a large broad flat hand, suited for burrowing . . . . APSEUDIDÆ.

Upper antennæ with a single flagellum. Second maxillæ rudimentary and naked.

Second gnathopods with narrowed joints, and fitted for walking . . . . TANAIDÆ.

Family I. APSEUDIDÆ.

Animal narrow, produced, depressed, the carapace usually laterally keeled. Segments of pleon well defined, narrower than those of peræon. Rostrum usually well developed, rarely absent. Ocular lobes commonly somewhat pyriform, occasionally taking the form of strong spine-processes.

Upper antennæ situated at the anterior corners of the carapace, with two multiarticulate flagella. Lower antennæ with their bases close together and appressed, lying between and below the upper pair; the second joint of the peduncle is often furnished with an articulated oblong or linear antennal scale, which is ciliated all round; flagellum multiarticulate.

Mandibles well developed, with a three-jointed palp. First maxillæ consisting of two members, and furnished with a backward-directed two-jointed palp, which terminates in two setæ. Second maxillæ three-lobed, the lobes setose and spinose. Maxillipeds with a four-jointed palp and large branchial lamina.

The first gnathopods are strong and chelate, the inner margin of the finger and thumb usually tuberculated in the male and serrate in the female.

Second gnathopods with the three last joints and especially the hand flattened; hand oblong or subovate, surrounded with numerous flattened spines, the number, character, and arrangement of which afford good specific characters; finger very strong, usually toothed; the whole limb is powerfully built and well adapted for digging. Both pairs of gnathopods are usually furnished with a minute, two-jointed palp attached to the coxa—the rudimentary representatives of the often largely developed palps (exopodites) of the Podophthalmous Crustacea.

Peræopods slender, the coxa always very long, more or less covered with setæ and spines, the varied form and structure of which are useful for diagnosis.

Pleopods composed of a peduncle and two setiferous branches.

Uropods two-branched, the inner filament of great length and multiarticulate, the outer shorter, though also multiarticulate.

*Synopsis of Generic Distinctions of Apseuidæ.*

Lower antennæ with a scale articulated to the end of the second joint.

First free segment with the epimera conspicuous, spine-formed, porrected. Gnathopods furnished with minute palps . . . *Apsæudes*, Leach.

First free segment with epimera small and not produced forwards.

Gnathopods without palps . . . . . *Parapseudes*<sup>1</sup>, G. O. Sars.

Lower antennæ without a scale.

Carapace composed of head and two following segments coalesced . *Sphyrapus*, n. g.

Genus 1. APSEUDES, Leach.

= *Eupheus*, Risso, = *Rhæa*, Milne-Edwards.

Animal elongate, gradually attenuating from the first to the last segment; pleon equal in length to  $2\frac{1}{2}$  or  $3\frac{1}{2}$  last segments of peræon.

Carapace usually furnished with a distinct rostrum, which is very variable in form and often long and acute. Eye-lobes with or without eyes, usually pyriform, rarely taking the form of a large spine. First free segment with the epimera spiniform and inclining forwards. Last segment of pleon never produced to an elongated point, obtusely rounded or truncate at the extremity.

Upper antennæ nearly alike in the sexes, outer flagellum longer than the inner. Lower antennæ with a distinct, movable, antennal scale, ciliated, attached to the second joint of the peduncle.

Epistoma with or without a spine.

Gnathopods of both pairs furnished with a minute and inconspicuous two-jointed palp at their base. The first pair with chelate hands, larger in the male than in the female; second pair with the hand usually ovate, flattened.

Pleopods well developed.

Leach's most erroneous and misleading figure of *Apsæudes talpa* was copied through a long series of years into numerous publications as the illustration of this genus. The first fair figure was that which Milne-Edwards gave of his *Rhæa latreillii*. These two species until recently were the only known representatives of the family.

<sup>1</sup> The typical and only known species of this genus is the *Apsæudes latifrons*, Grube (Die Insel Lussin und ihre Meeresfauna, p. 75).

*Diagnosis of Species of Apseudes here described.*

No rostrum, front truncate . . . . .	<i>obtusifrons.</i>
Rostrum minute, simple, a mere point.	
Epistoma furnished with a spine . . . . .	<i>talpa.</i>
Epistoma not furnished with a spine.	
Second gnathopods with an ordinary curved dactylus . . . . .	<i>latreillii.</i>
Second gnathopods with a curiously twisted dactylus . . . . .	<i>uncidigitatus.</i>
Rostrum long, acute, with a bulb-like swelling on each side of the base.	
Bulbs convex in front.	
Carapace with a pair of large lateral spines . . . . .	<i>gracilis.</i>
Carapace without lateral spines.	
Hand of second gnathopods ovate, not much longer than broad . . . . .	<i>spinus.</i>
Hand of second gnathopods elongated, linear, 3-4 times as long as broad . . . . .	<i>simplicirostris.</i>
Bulbs concave in front . . . . .	<i>lunarifrons.</i>
Rostrum tridentate, composed of three acute processes . . . . .	<i>grossimanus.</i>

Besides the foregoing species, four other forms have recently been recorded by Prof. G. O. Sars from the Mediterranean—*Apseudes tenuimanus*, *acutifrons*, *robustus*, and *echinatus*. The last certainly comes very near to, and may prove to be identical with, the *Apseudes lunarifrons*. A species has also been described by Studer from Kerguelen Island, *Apseudes spectabilis* (Studer, 'Isopoden der Reise S.M.S. 'Gazelle' um die Erde, 1874-76,' 1884, p. 23, pl. i. fig. 9, a-g).

## 1. APSEUDES TALPA (Montagu).

*Cancer (Gammarus) talpa*, Montagu, Trans. Linn. Soc. ix. p. 98, pl. iv. fig. 6.

*Apseudes talpa*, Leach, Edinb. Encyclop. vii. 1814, p. 404; id. Trans. Linn. Soc. xi. p. 372; id. Suppl. Enc. Brit. i. p. 428; Samouelle, Entom. Compend. p. 109; Lamarck, Hist. Nat. Anim. sans Vertèb. (deuxième édit.) v. p. 290; Latreille, Enc. Méthod. pl. cccxxxvi. fig. 26; Cuvier, Règ. Anim. édit. Latreille, pl. cliv. p. 124; édit. Crochard, Crust. pl. xlii. fig. 1; id. Anim. Kingdom, edit. Henderson, iii. p. 223, pl. xxxvi. fig. 4; Guérin, Icon. pl. xxvii. fig. 6; Lucas, Hist. Nat. des Crust. p. 243; Milne-Edwards, Crust. iii. p. 140; White, Brit. Mus. Cat. Brit. Crust. p. 67; id. Pop. Hist. Brit. Crust. p. 226; Gosse, Marine Zool. i. p. 136, fig. 245; Bate and Westwood, British Sessile-eyed Crust. ii. p. 148; G. O. Sars, Revision af Gruppen Isopoda Chelifera, 1880, p. 10.

? *Eupheus ligioides*, Risso, Crust. de Nice, 1816, p. 124, pl. iii. fig. 7; Hist. Nat. de l'Europe Mérid. v. p. 99; Desmarest, Consid. gén. Crust. p. 285; Milne-Edwards, Crust. iii. p. 142.

*Eupheus talpa*, Desm. Consid. gén. Crust. p. 285.

? *Apseudes ligioides*, Lucas, Hist. Nat. Crust. p. 243; Lamarck, Anim. sans Vertèb. (2<sup>e</sup> édit.) v. p. 291.

Rostrum triangular, acute. Ocular alæ obtuse. Eyes well developed. Segments of peræon narrower than carapace, each having a short triangular process at the latero-

anterior margin, and a strong spine on the middle of the ventral surface. The epistoma is always armed with a similar spine.

The pleon is rather narrow, the first five segments are produced laterally into sharp processes and beset with long plumose hairs; the last segment is much drawn out, and is subequal in length to the whole of the rest of the pleon; it has two small ciliated eminences on each side.

The upper antennæ have the basal joint half as long again as the second and third combined, with both its inner and outer margins partially serrulated; the flagella are shorter than the peduncle, the inner 6-, the outer 13-jointed.

The first gnathopods of the female are moderately strong, scarcely less than the second pair; the hand longer than the wrist, ovate, the finger armed with a tubercle near the base. The uropods are equal in length to half the animal, the peduncle ornamented with many plumose setæ on the outer margin; outer branch composed of seven joints scarcely equalling a fourth part of the inner branch in length. Colour white.

Length about 6 millim.

Montagu procured his types on a *Pecten maximus* at Salcombe, Devon. Spence Bate has found it in Plymouth Sound, and Mr. Cocks at Falmouth. Prof. G. O. Sars has taken it in the Mediterranean (Messina), and Heller in the Adriatic.

*Aapseudes talpa* may be known from *A. latreillii* (1) by the serration of the first joints of the upper antennæ, (2) by the spines which arm the epistoma and the ventral surface of the pereon-segments, (3) by the great length of the terminal segment of the animal.

Montagu's figure, copied again and again by various authors, is altogether misleading and erroneous. Milne-Edwards's figure, taken from one of Colonel Montagu's specimens, though somewhat better, is quite insufficient to distinguish the species. Bate and Westwood were the first to give characteristic drawings of the animal. Fortunately Colonel Montagu's specimens are still preserved in the British Museum, and have been kindly examined for us by Mr. Miers and compared with *A. latreillii*; and there can be no doubt that, as stated in the 'British Sessile-eyed Crustacea,' they belong to the species to which Montagu's name is here assigned.

The *Aapseudes talpa* of Lilljeborg, and of the earlier writings of G. O. Sars, is not this species, but *A. spinosa*, M. Sars.

We have not ourselves had the opportunity of examining specimens of *A. talpa*, and the foregoing description has been compiled from those of Sars and Bate and Westwood.

## 2. APSEUDES LATREILLII (Milne-Edwards). (Plate XVI.)

*Rhœa latreillii*, M.-Edwards, Ann. des Sci. Nat. 1<sup>re</sup> sér. xiii. p. 288, pl. xiii. a. figs. 1-8; id. Hist. de Crust. iii. p. 141; Cuvier, Règ. Anim. (édit. Crochard), Crustacés, pl. lxii. fig. 2; Latreille, Cours d'Entomol. p. 403; Lamarck, Anim. sans Vert. (2<sup>ème</sup> édit.) v. p. 291.

*Aapseudes latreillii*, Bate and Westwood, Brit. Sess.-eyed Crustacea, ii. p. 153; G. O. Sars, "Revision af Gruppen Isopoda Chelifera," Archiv for Math. og Naturvid. vii. 1882, p. 14.

*Male.* Frontal outline (I. D) in form as the lower part of an escutcheon, the rostrum short but acute, bent downwards at the extremity, and not equalling in length one third of the basal joint of the upper antennæ. Ocular processes not much produced, but pointed and deflexed at the extremity. Eyes conspicuous.

Carapace and peræon-segments (I. D) without spiny armature either on the sides or ventral surface, except that the last segment of the peræon has a large spine-like projection on the middle of its under surface. Sides of segments emarginate, and furnished with a few cilia in front of the place of attachment of the limbs.

Pleon (I. D) with the sides of the segments ciliated, and produced downwards and backwards (I. L) into small but acute points, which, however, occupy such a position that they are hidden when the animal is viewed from above; ventral surface of each segment with a central spine; last segment not much produced, scarcely equalling three preceding segments combined.

Upper antennæ (I. *a.s*) having the basal joint three times as long as broad, both margins flexuous, the outer with a cilium at half its length, and with a brush of cilia at the distal termination; second joint not half as long as the first, narrow at the base, but widening distally; third not half the length or half the breadth of the second; flagellum of thirteen articulations, every other articulation furnished with an olfactory appendage on its inner margin; secondary filament of five articulations.

Lower antennæ (I. *a.i*) having the peduncle equal in length to the first joint of the upper pair, the first joint having a lobe at the base on its inner margin; second bearing the antennal scale, which is 3-4 times as long as wide, ciliated all round, and reaching the middle of the fifth joint; third joint very short; fourth slightly longer; fifth more than twice the length of the fourth; flagellum of seven articulations.

First gnathopods (I. *gn*<sup>1</sup>  $\sigma$ ) having the basos massive, as broad as long; hand, exclusive of the thumb, as broad as long, a large tooth near the base of the inner margin of the thumb, which beyond this is minutely denticulate and ciliated; the denticulations, when examined under a high power, are found to consist of lancet-shaped processes, which are serrulate on the upper margin (and on both margins in the female); the finger has similar processes, but smaller, finer, and less erect.

Second gnathopods (I. *gn*<sup>2</sup>) have the coxa produced forwards into a triangular, pointed, and ciliated process, by the side of which is a minute two-jointed palp tipped with setæ (the rudimentary exopodite); there is also a similar palp at the base of the first peræopods; meros with a large distal spine below and a smaller distal spine on the back, carpus with two spines on the front, and a spine and bunch of cilia at the distal corner of the upperside; hand with three subequal spines, the more distant rather the larger, these spines alternate with sets of about three cilia, upper margin with two spines at the lower extremity; dactylos strong, with one and sometimes two denticles on the inner edge, and two cilia on the back; close to the base of the dactylos there is a very minute flattened lancet-shaped seta, furnished with rigid cilia on the margin,

its peculiar structure and position seem to indicate that it may be a delicate organ of touch.

Last legs (i. *ppp*<sup>s</sup>) having the hinder margin of all the upper joints set with long plumose setæ; meros bearing a long spine at the lower corner of the front margin; carpus with three spines on the front, and an oblique row of four spines on its flattened side; hand with a small simple spine at the base and a longer spine on each side of the insertion of the dactylos, also a row of 4-5 spines on the side; these spines, when carefully examined, are found to have their terminal portion channelled, and the edges of the channel denticulately serrated, but the extreme end of the spine is without this serration and is gently curved; but the most remarkable part of this remarkable hand is that the whole palm and distal margin, except when occupied by the spines already described, is beautifully pectinated with a row (about 30) of closely placed lancet-shaped spinelets, which, under a high power, are found to be exquisitely serrulated on both margins; finger long and slender, subequal in length to the hand, unguiculate, with a minute cilium at the origin of the unguis and a cilium on the middle of the upper margin.

Uropods (i. *pi. v.*) having the outer branch 4-jointed, first very short, second and third subequal, and each more than double the length of the first, fourth nearly as long as the second and third combined; inner branch very long, of about 32-36 articulations.

The female differs from the male in having the first pair of legs of much less robust character, especially as regards the hand, which is feebler and narrower (i. *gn*<sup>1</sup> ♀); the thumb without the tooth and with the serrated-edge lancet-processes excessively transparent; there is also a bunch of long cilia without, and a line of short cilia within the thumb.

Length 7 millim., or  $\frac{3}{10}$  of an inch.

*Apeudes latreillii* has not been taken in any of the Atlantic dredging expeditions; but it has seemed to us desirable, indeed necessary, that this species and *A. talpa* should be carefully described in order that they may be distinguished from each other and from the species first recorded in this paper, as well as from the many more allies which it is probable will before long be brought to light.

Our description is chiefly drawn up from specimens\* dredged by A. M. Norman in Guernsey, in Brelade Bay, Aug. 10, 1865. Some of these were placed in Bate and Westwood's hands, when they were preparing their work, and they are erroneously referred to by them as belonging to *A. talpa*. The specimen of this species which constituted the type described and figured by Bate and Westwood as *A. latreillii* is also in our collection. It is a female, and was taken on the Northumberland coast.

Professor G. O. Sars has taken it at Goletta and Naples.



3. *APSEUDES SPINOSUS* (M. Sars). (Plate XVII. fig. 1.)

*Rhæa spinosa*, M. Sars, Overs. over Norsk-Arktiske Region förekom. Krebsdyr (Vidensk. Selsk. Forhandl. 1858), p. 30.

*Apsuedes talpa*, Lilljeborg, Bidr. till Känn. Sverige och Norrige förekom. Isopodernas och Tanaidernas Familj, 1864, p. 9; G. O. Sars, Nye Dybvandserustac. fra Lofoten (Vidensk. Selsk. Forhandl. 1869), p. 45 (nec *A. talpa*, Montagu, nec *A. talpa*, Bate & Westwood).

*Female* (I. D). Frontal region much produced into a long acute rostrum, nearly half as long as the long basal joint of the upper antennæ; this rostrum is expanded greatly towards the base into rounded lateral bulb-like lobes, and deeply excavated centrally above (I. L), the sides being as it were upturned.

Ocular processes or alæ rather shorter than usual, broadly triangular, no vestige of eyes.

Carapace widening rapidly behind the rostrum, forming nearly a square; lateral margins slightly sinuous, and produced to a point in front, at the ocular suture.

First two free peræon-segments as broad as the carapace; third narrower but longer, the two following of still less width, but greater length, the last somewhat narrower and much shorter than the two which precede it; the antero-lateral margins of all these segments are produced outwards into conspicuous triangular pointed processes beset with verticillately plumose setæ; each segment of peræon and pleon has a central spine on the underside, and there is also a long acute spine upon the epistoma (I. L).

Pleon having the first five segments short, their epimera (I. PL.) produced directly outwards into greatly developed and conspicuous spike-like processes, each furnished with eight or ten very long verticillately plumose setæ; these setæ protrude directly over similar setæ of the pleopoda, and thus with them form a dense and elegant mass of plumage on each side of the pleon. The sixth segment is very long, equalling the united length of the five segments preceding, a little irregular in outline, without being decidedly spined; from small protuberances issue verticillately plumose setæ, the segment narrows before reaching the points of attachment of the uropods, and then starting from a small ciliated tooth it widens rapidly for the attachment of the uropods, and subsequently ends obtusely.

The upper antennæ (I. D) have the basal joint long and narrow, about five times as long as broad, with two longitudinal grooves on the upper surface which leave, as it were, a central and lateral rib, basal portion of inner margin finely serrated, in advance of this and at a point where the joint narrows a group of cilia spring; second joint about one third as long as the first, stout, distally dilated; third somewhat shorter and much thinner than second; flagellum longer than the peduncle, its articulations 20-22; secondary appendage more than half the length of the flagellum, consisting of 10 long articulations.

The lower antennæ (I. a. i) having the first short joint internally lobed, inner margin of the lobe bearing minute spines; second joint two fifths the length of the first joint

of the upper antennæ, the inner margin spined like the lobe just mentioned; third very short; fourth and fifth subequal to each other; antennal scale small, narrow, not quite reaching the end of the fourth joint; flagellum of 12-15 articulations.

The first gnathopods (I. L) have the basos short and broad, with a tooth on the middle of the upperside, and a curved spine below the centre of the front; the narrow and rather sinuous meros has a spine at the inferior extremity; the wrist widens towards the hand, and has its front margin angulated and armed with two teeth (which are more easily seen when viewed from the inner face); hand (I. *gn*<sup>1</sup>) broad and rather massive, thumb short and broad, with a large tooth-process in the middle, which fits into the cavity of the overarching finger, which is also furnished with a small tooth situated nearer the base than that of the thumb; distal portion of both finger and thumb slightly denticulate on the edge, the former also with a row of cilia within the margin; both finger and thumb tipped, as usual, with horny-looking nails.

In the second gnathopods (I. D and I. L) the meros has distally a spine on each margin; the carpus a distal spine on the back, and two on the front margin; the hand one or, more rarely, two distal spines above, and four or, more rarely, five spines on the palm; all these spines are more slender than is usual in this genus in similar positions. The finger has a central cilium on the back, and two or three minute teeth on the impinging edge.

The last pereopods (I. *pp*<sup>5</sup>) have the ultimate joints much produced and narrower than usual; hand four times as long as broad, with two simple slender spines near the base, and one on each side of the finger, a curved pectination sweeps semispirally round the joint from the base to the extremity, where it forms a crest round the finger; the pectination consists of a series of (60 or 70?) closely packed lancet-shaped processes, which are themselves serrulated on the upper margin; finger remarkably long, slender, and acute, nearly as long as the hand.

Length half an inch, or 12 millim.

The specimen described appears to be a female, as it has scale-like appendages to the inner base of the second, third, and fourth legs, which we take to be the commencing development of the egg-pouch. The side view of the head, however (I. L), is taken from a fragment which, from the greater development of the gnathopods, is probably a male.

The specimens just referred to were taken in the 'Porcupine' Expedition in 1869 S.S.W. of Ireland, in 725 fathoms (Station 36, lat. 48° 50' N., long. 11° 9' W.), and are identical with a Swedish specimen, for which we are indebted to Professor Lilljeborg.

We (A. M. N.) have since, in 1878 and 1879, dredged this species in great abundance in some of the Norwegian fiords, more especially near Lervig, at the mouth of the Hardanger Fiord, in 180 fathoms, and near Drobak in the Christiania Fiord.

## 4. APSEUDES UNCIDIGITATUS, n. sp. (Plate XXI. fig. 1.)

This pretty little species, which has the limbs elegantly banded and mottled with umber-brown, in many respects resembles *A. talpa*, but in some points differs from all other known members of the genus. Thus the dorsal surface is almost smooth, instead of being much waved and indented as in other species, while the second segment of the peræon is much more closely soldered to the first than usual, and thus becomes almost a part of the carapace, an approach being thus made in this species to that soldering of two peræon-segments to the cephalon which is more fully carried out in the new genus *Sphyrapus* of this Memoir.

Frontal region (i. c) in the form of the base of an escutcheon inverted, the rostrum almost evanescent, and only represented by a small point; frontal region scarcely extending one fourth the length of the basal joint of the upper antennæ.

Ocular processes or alæ curving a little round the upper antennæ, acutely pointed, and projecting forwards beyond the very short rostrum. No appearance of eyes.

The carapace (i. d) has nearly parallel sides, not expanded at the point of origin of the gnathopods. Peræon-segments remarkably even in breadth and length, though each successively very slightly narrower than the preceding; base of second peræon-segment a little excavated on the sides in the neighbourhood of the coxal spine; the hinder corners of the segments are sharply angled, those of the penultimate and antepenultimate produced backwards into minute spine-points; antero-lateral margins not spined, rounded, having a few very minute cilia; no spines on the ventral surface, except a central spine on the last segment.

The pleon (i. l) has the epimera of the five first segments produced into spiny points, which are directed backwards and are visible from above; they bear a few minute cilia, which, however, are so small as only to be seen when looked for with the microscope, each segment has also a ventral spine (i. l). Last segment equalling in length 2-3 of those which precede it.

The antennæ are very similar to those of *A. talpa*; the upper (i. a.s) have the flagellum nine-jointed, and the secondary appendage five-jointed; the olfactory filaments are very long, that attached to the antepenultimate articulation far overtopping the end of the flagellum. The lower antennæ (i. c. v.) have the antennal scale ovate, reaching the end of the fourth joint of the peduncle, the filament is six-jointed.

The first gnathopods (i. gn<sup>1</sup>) show some resemblance to those of the young male of *A. talpa*. The basos is short and thick, the wrist long and parallel-sided; the hand short, widening rapidly, and triangular, the thumb portion not projected forward, but thrust out laterally, having a central tooth, a group of cilia at the base, and a line of cilia edging the distal part, which is not denticulated; finger with several long cilia at half its length on the back, while the central portion of the inner side is denticulate and ciliate.

The second gnathopods (i. gn<sup>2</sup>) are remarkably strong, the last joints much expanded,

and the spines robust; meros with a single spine on the lower margin; carpus with two spines on the lower, and a distal spine on the upper margin; hand with two spines above and four on the palm, cilia alternate with these palm-spines; finger contorted, at first curving downwards, and then at half its length bent backwards, in the middle of its outer margin a long slender spine and a minute cilium, on the inner side a single denticle.

Last peræopod (i. *pp*<sup>5</sup>) short, the joints broadly flattened, basos scarcely more than twice as long as broad, not spined or setose; ischium minute, rudimentary, meros with three long plumose setæ on the back, and six long simple cilia and a distal spine on the front margin; carpus ovate, with five long plumose setæ on the back, and four long spines and about seven simple long cilia on the front margin; there are also two spines on the side, the spines of the front margin are serrulate on the edge towards their terminations<sup>1</sup>; hand ovate, rounded at the extremity, not more than two and a half times as long as broad, with four long serrulate-edged spines on the distal part of the back, and one similar spine on the palm, the whole of the palm and rounded end of the joint pectinately fringed with closely-set lancet-shaped spines; these spines differ from those of allied species in being longer, acutely pointed at the extremity, and serrulate on both sides; finger slender.

Length 6 millim., or about a quarter of an inch.

Dredged in the Mediterranean off the African coast by the 'Porcupine' in 1870, Station 40. The depth we are not able to give, as there were three dredgings at this station which were in 51, 152, and 510 fathoms.

A very remarkable character in this species is the twisted character of the finger of the second gnathopod (i. *gn*<sup>2</sup>). The first impression on seeing such a form was that it was a monstrosity, an impression only removed when it was found that the fingers of this pair of legs in the two specimens procured were all of identical structure.

##### 5. *APSEUDES OBTUSIFRONS*, n. sp. (Plate XVIII. fig. II.)

Frontal region (II. D) not only truncate, but even emarginate, without any indication of a rostrum, the anterior margin being folded underneath instead of porrected.

Ocular processes narrow, much produced, terminating in attenuated spine-points.

Carapace square in its front portion, but expanding with arched sides at the first coalesced peræon-segment; the second peræon-segment very similar in form to the coalesced first segment, though distinctly articulated; coxal spiny process very long and acute. Each of the remaining peræon-segments has a pair of acute anterior lateral spine-like points projected at right angles to the body; while the epimeral processes, which overhang the coxæ of the limbs, have a small spine on the front side. The epistoma bears an acute spine (II. L), and a median spine arms the under surface of the last two segments.

<sup>1</sup> It requires a  $\frac{4}{10}$ - or  $\frac{1}{4}$ -inch object-glass to show the structure of these and similarly curiously formed spines referred to in these descriptions.

The pleon has the epimera produced into small spines, which are more conspicuous on the two anterior segments. Sixth segment as long as three preceding, its termination truncate and emarginate.

The upper antennæ have the large basal joint three-sided, and partially serrulate on the upper edge.

The first legs have the basos short and distally thickened, with a small tooth on the hinder margin; hand (*ii. gn*<sup>1</sup>) not unlike that of *A. simplicirostris*, the basal portion broadly triangular, the thumb inclining outwards, with a tooth rising in the hollow to meet the overreaching finger, the nails of both thumb and finger long.

The second legs (*ii. gn*<sup>2</sup>) are long, the basos produced, meros with one infero-posteal and two infero-anteal spines; carpus with three spines on the hinder and four on the front margin; hand with four spines confined to the distal half of the hinder margin, and seven front spines, the first of which is minute, the rest subequal; finger with three minute teeth on its edge. All the spines of the limb are of slender character, and there is a total absence of the cilia, which in most allied species take part with the spines in the garnishing of the lower joints of this limb.

All the remaining limbs are remarkable as differing from those usual in the genus by their more delicate and simple structure, there being a marked absence of that elaborate and diverse ornamentation of spines, setæ, and cilia so characteristic in the genus. This will be evidenced in the following description of the last pair of legs.

The last legs (*ii. pp*<sup>3</sup>) are slender and delicate in structure; the basos narrow and long, and perfectly glabrous (without spines, setæ, or cilia), is as long as the three following joints combined; ischium very short; meros shorter than carpus, the former with one, the latter with two cilia at distal extremity of front; hand long, narrow, about six times as long as broad, and subequal in dimensions to the wrist, with a single slender spine midway on the front margin, and two long, slender, simple spines at the origin of the very long and very slender finger, which has a small cilium at one third its length on the outer, and a more distant toothlet on the inner margin.

The pleopods, with one exception, were abraded in our specimen, the one that remained was a very delicate slender organ.

Length 6 millim.

A single example was dredged in the 'Porcupine' Expedition of 1870, just west of the African side of the Straits of Gibraltar, in 128 fathoms (Station 37, lat. 35° 50' N., long. 5° 26' W.; bottom temperature 54° Fahr.).

6. *APSEUDES LUNARIFRONS*, n. sp. (Plate XVII. fig. II.)

? *Apseudes echinatus*, G. O. Sars, "Isopoda chelifera," *Archiv for Math. og Naturvid.* vii. 1882, p. 13.

A remarkable species on account of the great irregularity of the dorsal surface of carapace and peræon, and of the lateral margins of the segments of the latter.

The carapace is mapped out into no less than twelve distinct areas above, exclusive of the epimera of the first legs, which, as usual, are folded inwards, covering a portion of the under surface; second segment divided into three areas, the epimera being distinctly parted off from the central portion.

Frontal region (II. c) furnished with an acute rostrum of considerable length; at the base the rostrum widens greatly, spreading out on each side into a semilunar process, the horn and hollow side of which points forward, whilst the arc forms the external margin; on each side of this the boundary lines of the alar processes slope rapidly backwards, until ultimately the front margin of the carapace juts outwards and forwards into an acute lobe; behind this, again, another lobe throws out a lateral acute point (II. D. L), while in front the alar process projects considerably and terminates in an acute point; thus the carapace when viewed from above presents three spine-like processes on each side.

Second (first free) segment with the forward-directed coxal spine-like process acutely terminated. The remaining segments of the peræon have the epimeral processes, which are produced over the coxæ, furnished with a spine on the hinder angle, the three last segments have also a minute spine on the front angle of the epimera, the side of each segment is also armed in front of these epimeral processes with a large outwardly directed spine-like process. The epistoma (II. c. L) is furnished with a long spine, and each of the free segments of the peræon has on the ventral surface two spines on the median line, the anterior of which is very much smaller than the posterior; on the three front segments these spines curve backwards, and on the three last they curve forwards.

The spine-like lateral processes of the five first segments of the pleon are very large and at nearly right angles to the pleon, ornamented with long plumose hairs, the feathering in many cases, perhaps in all, ending in a sort of lapell or bunch of hairs. The last segment equals in length about four of those preceding, and has the peculiarity of a conspicuous lateral spine on each side, a little in front of the attachment of the uropods; fine slightly plumose hairs also spring from many parts of the surfaces, both dorsal and lateral. On the under surface each of the abdominal segments bears (instead of the usual central spine) a pair of tubercular processes, one on each side of the median line, and just within the bases of the pleopods.

The upper antennæ are wanting, except a fragment of the stout basal joint, on the inner side of which there is a short triangular spine.

The lower antennæ are slender, the articulations short, but of nearly the same relative lengths as in allied forms; the flagellum consists of 9-10 articulations.

The first gnathopods (II. *gn*<sup>1</sup>) have the basos short and broad, its front margin produced about the middle into a curved spine-like tooth; meros flask-shaped, with the neck adjoining the basos; wrist narrow, greatly elongated, more than six times as long

as broad, widest distally; hand with a very long thumb and finger, closely resembling the corresponding parts in the female of *Apseudes talpa*.

Second gnathopods having the basos strongly built, and of uniform width throughout; following joint short; the rest of the limb imperfect.

The condition of the last legs (II. *ppp*<sup>b</sup>) is also such that we are unable to describe the garnishing of cilia, setæ, and spines as accurately as has been done in the case of other species. The basos is long; carpus longer than either meros or hand, which are subequal to each other, these three joints flattened. Carpus having a vertically-plumose seta infero-anteally; hand ovately rounded distally, with three or four small cilia on the hinder border; front margin naked on the first third, then a long spine; beyond this this margin is pectinately spined, the pectination, as usual, extending round the extremity, there is also a long spine above the insertion of the finger; finger long, slender, and gently curved. The coxæ of this and of the two preceding pairs of feet are distinctly protruded as joints beyond the coxa-like looking epimera (the limbs thus looking as though they were eight-jointed), and are armed behind with a curved spine; the coxa of the third legs has also a curved sharp spine, but this is on the front side, and directed forwards, like the characteristic process of the second legs.

Length one third of an inch.

A single example from the 'Porcupine' Expedition in 1870, dredged in the Mediterranean off the coast of Algeria (Station 50, 51-510 fathoms).

#### 7. APSEUDES SIMPLICIROSTRIS, n. sp. (Plate XVIII. fig. 1.)

*Male*. Frontal region (I. D) produced into a long, gradually attenuated, rostral spine, inclining downwards; though long as compared with the carapace, the rostrum is scarcely more than one third the length of the very long basal joint of the upper antennæ; the frontal region has a minute projection on each side of the base of the rostrum.

Ocular processes wide and short, but produced apically into a point, which, however, is so bent down as not to be visible from above.

Carapace having the cephalic portion narrow, the sides without any of the projecting angular processes which are present in *A. lunarifrons* (which is perhaps its nearest ally), and gradually converging towards the frontal region; the soldered first thoracic segment, however, suddenly widens, the sides being boldly arched, and here is the greatest width of the body.

Pereon remarkable on account of the irregularity of outline of the sides; each of the last four segments has its anterior portion narrow, and is behind considerably expanded over the coxæ; the third and following segments have each a pair of laterally directed spine-like processes, those of the third and seventh segments being smaller than the others; the fourth segment has also one pair, and the fifth and sixth two pairs of tubercular sharp processes on the sides in front of the spines. Beneath,

the epistoma carries an acute spine, as does each segment of the peræon, except the last, which, in the same position, carries a large and stout process (I. L), nearly as thick as the basos of a peræopod, and two or three times as long as the ventral spines—the male organ.

Pleon with the epimera prolonged into acute processes, which are directed at first outwards, and ultimately backwards; these as well as the spines of the peræon are perfectly glabrous, and free from ciliation; beneath, each of the first five segments bears an acute spine; the sixth segment is very long, almost equalling the rest of the pleon, smooth, extremely truncate, but a little exerted in the middle.

Antennæ unusually long; the upper with the joints of the peduncle bearing nearly the same proportion to each other as usual; the first very long, cylindrical, but slightly angular, glabrous; filament of twenty-four articulations. Scale of lower antennæ (I. *a.i*) very narrow and linear, its marginal setæ few and distant, only twelve in all.

Mandibles with a greatly developed palp (I. *m*).

The first gnathopods (I. L and I. *gn*<sup>1</sup>) have the basos oblong, stout, and strong; the meros is triangular, embracing within the base of the triangle the apex of the triangular carpus, which about equals the basos in length, and only has three distant cilia on the front margin; hand with the thumb projected laterally, so that its margin is scarcely more advanced than the base of the finger; near the base of the thumb is a projecting semicircular process, which is centrally hollowed, containing, as it were, a small pocket; a long, narrow, acute, conical process near the base of the impinging margin; beyond this the margin is crenated; on one side this crenated margin is furnished with a close, regular series of short, stiff, spatulate hairs (I. *gn*<sup>1\*</sup>), on the other with a series of minute, flattened, jagged-edged, upright, microscopic teeth, one such tooth occupying each crenation; the finger is well arched, close to its base are two rounded tubercles, and the rest of the inner margin is slightly crenately waved, each sinus thus formed carrying a short, stumpy, spine-like tooth.

Second gnathopods (I. L and I. *gn*<sup>2</sup>) of weaker structure than usual, the pectinated spines of the more distal joints assuming almost the form of stout cilia, while the cilia on the other hand are so stout as almost to become spines; basos with a tooth near its origin; ischium very short; meros with a row of cilia passing obliquely along the side, and terminating distally above, three or four setæ also at the distal front corner; wrist longer than either meros or hand, its margins furnished with numerous greatly developed cilia (20 on hinder, 15 on front margin), the front margin also bears two slender spines, one near its centre, the other terminal, the distal side of these spines is pectinated; hand bearing cilia and spines of similar structure and size to those of the wrist, of the former there are eleven on the hinder and six on the front margin, together with four spines; finger with two minute cilia on the outer and three denticles on the inner margin.



Last peraeopods not furnished with plumose setæ, or with a pectinated margin to the hand, the whole limb of very simple structure. Basos long and narrow, naked; ischium very short; meros four times as long, smooth, except that there are three or four minute cilia terminally; carpus equal to two preceding joints combined, with only four minute, slender, simple spines on the front margin, and three cilia at the end; hand (i. *prp*<sup>3</sup>) shorter than wrist, smooth on the back, below with four slender slightly serrated spines, alternately with four others which are simple and very small, at the termination a cluster of about eight small spines round the base of the remarkably long and very gradually attenuating finger.

Length 15 millim., or three fifths of an inch.

The single specimen here described was taken in 1263 fathoms, about one hundred miles directly south of Rockall, 'Porcupine' Expedition 1869. Station 22, lat. 56° 8' N., long. 13° 34' W.

The type has some curious irregular developments in one or two parts. The third leg has a curious outgrowth, the upper portion of the basos being prolonged backwards into a large double tooth (Pl. XVIII. fig. 1. *prp*<sup>3</sup>), the corresponding portion of the opposite limb being entirely devoid of any such excrescence; and the lateral spines of the segment to which these limbs are attached are not symmetrically placed, the spine on the same side as the excrescence being in an abnormal position. The first legs also present another, though less conspicuous, want of uniformity, the wrist on one side having the distal margin nearly straight on both faces of the hand, while the other wrist has these margins somewhat deeply excavated.

#### 8. *APSEUDES GROSSIMANUS*, Norman. (Plate XIX.)

*Apseudes grossimanus*, Norman, MS. Proc. Royal Soc. no. 125 (1870), p. 157.

Frontal region armed with three porrected spines, the central or rostral spine long and very acute, nearly two thirds as long as basal joint of upper antennæ.

Ocular processes short, bluntly rounded distally, and thus differing from those of all the other species here described.

Carapace very short and broad, with a strong tooth-like process on each side in front of coalescence of the first peræon-segment.

The peræon has a pair of lateral spine-like processes to each segment, and the epimera of the second and two following legs also bear a spine at the linder margin. Beneath there is a spine on the epistoma (i. L) and on each peræon-segment, but in the male the spine of the last segment is exchanged for a large male organ similar to that described under *A. simplicirostris*.

Pleon having the epimera produced outwardly into acute processes, which bend backwards at the end; beneath each has a central spine; last segment equal in length to four or five preceding, cylindrical, with two pairs of very small cilia on the back, and a little tubercle on the median line between the bases of the uropods.

The upper antennæ have the first joint long, not flattened out, rather wider at the base, lower parts of the inner margin slightly denticulate, towards its extremity two long cilia, and beyond these a tactile seta, outer margin with three or four minute tactile setæ, and about as many simple cilia: second joint with four long plumose (tactile?) setæ and two simple cilia; third with two simple cilia; flagellum with 17-21, secondary appendage with 9 articulations; olfactory filaments of great length, attached to alternate articulations of the flagellum.

The lower antennæ have the scale long and linear, reaching beyond the fourth joint, with only six marginal setæ (one on the inner, two on the outer margin, and three apical): last joint of peduncle bearing two simple cilia at its end and four tactile setæ, two of which are much larger than the others; flagellum of 9-13 articulations.

The first gnathopods in the male (I. L) have the basos broad, attached to the coxa by a narrow neck, terminating in a tooth at the lower front angle, and having a similar tooth somewhat higher up upon the same margin; meros triangular, very narrow at the base and rapidly widening, a very large tooth-process on the front margin, articulating with the wrist in a splice-like manner, the lower angle being produced and underlying the wrist, the latter joint is narrowed at the base and lies on the produced tongue of the meros, and bears four cilia and a tooth-process on the front margin; hand in general form as that of *A. simplicirostris*, but the portion before the thumb is larger, while the thumb itself is less laterally directed; the outer margin of thumb carries about seven cilia, and its inner margin has two processes, of which the basal is tubercular, the second large and wide, much elongated, and beyond these processes the edge bears a closely packed series of microscopic flat inclined teeth, by the side of which are about eight stiff cilia (not spatulate as in *A. simplicirostris*); the finger has a tubercle on the inner margin near the base, is then hollowed for the reception of the large tooth of the thumb, and beyond this is set with numerous short spine-like teeth. The same gnathopod in the female (I. *gn*<sup>1</sup> ♀) is like that of the male in its general character, but is much more slender, the hand much less strong, the thumb and finger meeting throughout their entire length, without the large tubercular processes, while the whole margin of the thumb is set with microscopic teeth and cilia similar to those which occupy only the distal portion of the thumb in the other sex.

The second gnathopods (I. *gn*<sup>2</sup>) have the coxal spine narrow and acute, the basos unarmed, ischium very short, meros with a terminal cluster of cilia above, and below with a distal spine and numerous long cilia on the margin; carpus and propodos subequal and shorter than meros, the former with numerous long cilia on both margins and also two spines on the front margin; propodos with numerous long cilia on both margins (about 8 on the palm), and 5-6 spines on the palm and one distal spine on the back; dactylus bearing on its edge six spinules (I. *gn*<sup>2\*</sup>), which have little cilia near their tips. The spines of carpus and propodos, examined under a high power, are found to have a peculiar character, the carpal spines are spatulately hollowed at their

terminations, while the spines of the palm are mucronately attenuated at their apices, the attenuated flexible distal portions being exquisitely pectinately ciliated (see enlarged figure).

Last legs (*i. pp*<sup>5</sup>) slender; basos long and narrow, with only 6-7 short and delicate plumose setæ on the hinder margin; ischium very short, naked; meros about three times as long, with only two or three small cilia at the termination in front; wrist equal in length to two preceding joints combined, with about ten long cilia on the front margin; propodos a little shorter than carpus, with four cilia on front margin, these cilia are suddenly attenuated at their apices, and a series of minute sharp spinules, which are bulbously enlarged at the base, fill up the spaces between the origins of the cilia. These spinules do not actually touch each other, they are pectinated on the sides as in other allied species; they do not extend round the termination of the joint, but at the termination of the hinder margin there is a group of minute pectinate spinules, together with two long and one short flagellated spines. Dactylus very long and slender, with two cilia on the back, and one minute denticle near the base on the inner side; its unguis very long.

Pleopoda (*i. plp*) largely developed, with long peduncles.

Length half an inch.

Dredged off the Portuguese coast, in 740 fathoms, 'Porcupine,' 1870, Station 17 *a*, lat. 39° 39' N., long. 9° 39' W.; also off the south-west coast of Ireland, in 90 fathoms, 'Porcupine,' 1869, Station 6, lat. 52° 25' N., long. 11° 40' W.

#### 9. APSEUDES GRACILIS, n. sp. (Plate XX.)

The carapace (*i. d*) has the frontal margin produced into a long slender acute rostrum, which is half as long as the basal joint of the upper antennæ, and has a bulbous process on each side at its origin; ocular processes or alæ having their outer sides prolonged into an acute spine-like termination projecting forwards and slightly outwards. On each side of the carapace, at the junction of the first coalesced segment of the peræon with the cephalon, there is another pair of spinous processes closely assimilating in form to those of the alæ just described.

The peræon (*i. l*) has the segments remarkably long, more produced than in any other known species, especially the last four; each segment bears a pair of lateral acute spinous processes, and in front of these a pair of small tubercles, while on the ventral surface there is a large acute curved spine near the hinder margin, and near the front margin a small tubercle bearing two or three minute cilia. The epistoma is tumid, arched, carinate, and armed with a small spine near the mouth.

The pleon (*i. l*) is of great length, the five front segments subequal, and each as long as the first free segment of the peræon; epimera only slightly produced, terminating in small spines, a central ventral spine on each segment; last segment (*i. pl*) as long as the preceding three, having a number of minute tubercles about it, termination

slightly emarginate, with a small rounded projection occupying the centre of the emargination.

Upper antennæ (*i. a.s*) with the basal joint moderately stout, a tactile seta halfway up the outer margin; second and third joints subequal, their combined length scarcely more than half that of the first joint; filament consisting of about 17, secondary appendage of 4, articulations.

Lower antennæ (*i. a.i*) reaching to the end of the peduncle of the upper; the scale smaller than usual, only reaching to the middle of the fourth joint, and bearing only four setæ, two on the exterior margin and two apical, and none on the interior margin.

The first gnathopods (*i. gn<sup>1</sup>*) are slender and weak, and without much character; wrist very long, two and a half times as long as meros, with many cilia on the front margin; hand with the basal portion slender, and scarcely wider than the wrist; thumb and finger long, without any tubercular processes on the inner margin, the distal portion of that of the thumb bearing a series of microscopic flattened teeth, and short, stiff, obtusely ending cilia; finger having about five short stumpy spine-like teeth just before the unguis commences.

Second gnathopods (*i. gn<sup>2</sup>*) strongly built, basos naked; meros having the front margin ciliate, and bearing a distal spine, upper margin with a distal bunch of cilia; wrist unusually short, scarcely more than half the length of meros, above with many cilia and a large distal spine, below with four cilia and two or three spines; hand widely ovate, rather longer than the wrist, upper margin with two spines and a few cilia; palm closely set all round with ten stout spines, but no cilia; all the spines of the limb are stout, but quite simple in character; finger strong, with four denticulations on the margin.

Last peræopods (*i. prp<sup>3</sup>*) slender, basos naked, the three succeeding joints having one or two minute cilia on the front margin, except that the carpus (which is slightly longer than the meros and hand, which are subequal to each other) has a long slender distal spine on the front; hand with a distal spine above, and two slender spines on the palm, and passing obliquely across the last half of the joint, commencing beyond the middle of the palm and terminating at the upper margin of the origin of the finger, is a pectinated series of lancet-shaped spines, of which the margins are apparently simple. Finger of most unusual length, half as long again as the hand, the unguis especially being very greatly produced.

Pleopods (*i. plp*) greatly developed, the peduncle long.

Uropods with one branch consisting of about 7, the other of 18, articulations.

The foregoings is a description of the females, one of which has incipient growths of the marsupial sac at the base of the 2nd, 3rd, 4th, and 5th peræopods.

The males, which are known by the cylindro-columnar sexual organ situated between the last peræopods, where it takes the place of the ventral spine of the other sex, differ in having the lateral spines of the peræon-segments, and both epimeral and ventral

spines of the pleon, so much reduced in size as to become almost obsolete, while the ventral spines of the earlier segments of the body are as large as in the female, and the hand of the first legs is not more largely developed than in the other sex. All these points are contrary to what is usual, and not what might have been expected to characterize the male.

The figure (1. *gn*<sup>1\*</sup>) represents a monstrous outgrowth of the thumb in one of the specimens, showing a tendency to three terminations of the thumb instead of one.

Length half an inch.

Specimens or fragments of *Apseudes gracilis* were procured in three of the dredgings of the 'Valorous' Expedition in 1875; the localities were:—

Station 9, lat. 59° 10' N., long. 50° 26' W., 1750 fath., Davis Strait.

Station 12, lat. 56° 11' N., long. 37° 41' W., 1450 fath., North Atlantic.

Station 16, lat. 55° 10' N., long. 25° 58' W., 1785 fath., North Atlantic.

It would thus appear to be confined to the greatest depths in the abyss of the Northern seas.

#### Genus 2. SPHYRAPUS<sup>1</sup>, n. g.

Animal less elongated than in the other genera, widest at the hinder part of the carapace, thence gradually narrowed behind. First two segments of peræon coalesced with the cephalon into a carapace, furnished with a simple rostrum. Epimera of gnathopodal segments not produced forwards. Last segment of pleon often produced to an acute point.

No eyes. The alæ minute, triangular.

Upper antennæ with the basal joint of great size, long and broad, inner flagellum sometimes rudimentary. Lower antennæ without the scales generally characteristic of this family; slender.

First gnathopods bulky, with the hand (in the male) set on the wrist, like a hammer at right angles to its handle, and hence the generic name.

Typical species—*Sphyrapus malleolus*, n. sp.

The chief characters in this genus are the absence of the scale in the lower antennæ and the conjunction of the second peræon-segment with the carapace.

#### *Diagnosis of the Species of Sphyrapus.*

Last segment of pleon not produced.

Epimera of pleon obtusely rounded . . . . . *anomalous*.

Epimera of pleon angularly pointed . . . . . *serratus*, G. O. Sars<sup>2</sup>.

Last segment of pleon produced to an elongated point behind.

Second segment of pleon with greatly developed, outspread lateral processes . . . . . *malleolus*.

Second segment of pleon with lateral spines not exceeding in size those which are present also on the other segments . . . . . *tudes*.

<sup>1</sup> σφύρα a hammer, πούς a foot.

<sup>2</sup> "Habitat in magno abyso aree frigidæ maris Norvegiæ et glacialis."

## 1. SPHYRAPUS MALLEOLUS, n. sp. (Plate XXII. figs. II., III.)

Rostrum short and obtusely pointed. Ophthalmic processes (III. D ♀) minute, shaped like a baker's cap, and more easily seen from below (II. aa) than from above. The confluent segments are both wider than the head, and the second wider than the first; to the rear of these the animal tapers irregularly, the centre peræon-segment being narrower than its neighbour, as is also the case in *S. tudes*, and the pleon tapers more suddenly than the peræon as far as the base of the sixth segment, the sides of which diverge to the point of insertion of the uropods, and then suddenly converge to a central and somewhat upturned, much produced, apical process (III. Pi.). Of the peræon-segments the last two are the shortest. The first five segments of the pleon are nearly equal in length to one another; only the second has lateral spine-like processes, but here they are large, produced, and very conspicuous.

The upper antennæ (II. aa) have the basal joint large, in the male stout, shorter than the cephalic plate, in the female dilated at the base, longer than the cephalic plate, in both ciliated on the margins; the second joint is short, dilated distally; the third is about half the length and breadth of the second; the flagellum consists of one long succeeded by four short articulations; the secondary appendage is rudimentary, and represented by only one minute articulation.

The lower antennæ have the basal joint as broad as it is long, the three following joints short, the fifth long and slender, carrying on the outer side two pear-shaped vesicles; the flagellum is three-jointed, the second and third joints furnished with long cilia.

The first gnathopods (II. gn<sup>1</sup>) have the soldered coxal portion folded beneath; the basos broad and short, the ischium wanting; the meros narrow at the base, then dilated, and ending in a point; the carpus in the male is a little longer than the meros, which it overlaps; it is pointed distally, its sinuous margins are nearly parallel; upon it the huge hand is set hammer-wise. In shape the hand is roughly triangular; a line from the base of the finger to the stout horny thumb may be considered the base of the triangle; along this (palm) margin is set a row of flat little teeth, all but one or two of them lying closely side by side; one of the sides of the triangle runs from the thumb-nail backwards, receiving the wrist in a sinuosity about the middle, the remaining side is formed by the curved line running from the hinder extremity of the last-described side to the base of the finger; the finger, which is short and stumpy, with a nail like the thumb-nail, doubles closely down upon the palm. In the female (III. gn<sup>1</sup>) the wrist is considerably longer than in the male, and is of the same breadth at both ends, but has a narrow neck near its base; the hand in this sex is attached to the wrist by the apex of the triangle; the thumb is a long process projecting from the base of the triangle, and causing the finger to project in like manner, and the hand is thus of very different form from that of the male, being ovate; the inner margins of both thumb and finger are irregular; the thumb is truncate and has the horny nail set close

to the outer margin; the nail of the finger closes down into the cavity within the thumb-nail and on the truncated end of the thumb.

The second gnathopods (II. *gn*<sup>2</sup>) resemble those of *Sphyrapus tudes*, but the basos is narrower, being only slightly broader than the following joints; the meros has one distal spine on the front margin, the wrist a row of five spines, and the hand the same number; the finger is much curved, slender, and its margin smooth.

In the first peræopods (II. *prp*<sup>1</sup>) the wrist is a little dilated, the hand flat, long, curved, with seven slight spines on the front margin, and much ciliated on both margins.

The second peræopods (II. *prp*<sup>2</sup>) are shorter than any except the last; the third (II. *prp*<sup>3</sup>) have the hand short, distally dilated, and then surrounded by a fence of biserrate spines of varying lengths. The fourth and fifth (II. *prp*<sup>4</sup>) pairs are similar in form, but the fifth is smaller than the fourth; the wrist is longer than the hand, which is small, ciliated, and having two long spines near the base of the finger.

The uropods (III. *u* ♀) have the peduncle as long as the segment minus its produced apex, and a little dilated distally; the inner branch is long, with about 15 articulations, which vary irregularly in length; the outer branch is very slight, and composed of 3 articulations. Judging from the spirit-preserved specimens the uropods in this species would seem to be carried divergently, not following behind parallel to each other.

*Sphyrapus malleolus* may at once be distinguished from its allies, not only by the form of the gnathopods, but by the rudimentary condition of the inner flagellum of the upper antennæ, which is reduced to an unjointed minute tubercle, and by the spine-formed wings of the second segment of the pleon.

The species has been procured in the abyss of the North Atlantic in four dredgings:—

1. 'Porcupine,' 1869, Station 22, lat. 56° 8' N., long. 13° 34' W., 1263 fathoms.
2. 'Porcupine,' 1869, Station 24, lat. 56° 26' N., long. 14° 28' W., 109 fathoms.
3. 'Porcupine,' 1870, Station 17 *a*, lat. 39° 39' N., long. 9° 39' W., 740 fathoms.
4. 'Valorous,' 1875, Station 11, lat. 57° 11' N., long. 37° 41' W., 1450 fathoms.

The first two of these localities are to the south of Rockall, and may be considered to be within the bounds of British seas; the third is to the west of Portugal; the last lies directly south of the southernmost point, Cape Farewell, of Greenland.

## 2. SPHYRAPUS TUDES, n. sp. (Plate XXII. fig. 1.)

The carapace (I. *D*) has a short triangular rostrum, from which it slopes gently backwards to the insertion of the small bulbous, apiculate, ophthalmic processes. Behind these the lateral margins are slightly convex; the two peræon-segments, which are coalesced with the head, are successively wider; the coxal portion of the first has a large ventral fold. Behind the cephalic region the animal gradually tapers to the last pleon-seg-

ments, except that the central (fourth) peræon-segment, which carries the shortest pair of legs, is also a little narrower than that which follows it.

The first five segments of the pleon are short, produced on either side into long narrow processes pointing backwards and downwards (1. L), so as not to be seen from above; the sixth segment (1. *ur*) widens a little from the base, not far from which the caudal appendages are inserted; beyond their insertion it is narrowed, and a small globose portion ends in a produced apex; the whole length of the segment nearly equals that of all the five which precede it; beneath it has a nearly circular opening with two opercular valves opening sideways, as in the genus *Apseudes*.

The upper antennæ (1. *aa*) have the basal joint about two thirds the length of the cephalic plate, rather stout, carrying two rows of divergent cilia; the second joint is of less breadth and short; the third still narrower and very short. The flagellum has seven articulations, some of which carry fine, glass-like, two- or three-jointed olfactory appendages; the secondary filament has three articulations.

The lower antennæ have the basal joints something like the ophthalmic processes in size and shape; the three following joints are short, the fifth as long as the four which precede it taken together; the flagellum has four slender articulations, and slightly exceeds in length the last joint of the peduncle.

The first gnathopods (1. *gn*<sup>1</sup>) have the basos bulky, with a small spine on the hinder margin, the ischium wanting, the meros small, the wrist large, irregularly oblong, but very narrow at its articulation with the meros. The great hand is set on at right angles to the wrist, like the head of a hatchet or hammer; it has a narrow oblong elongated thumb, so curved backwards at the base as if it were out of joint, and into the cavity thus formed a blunt tooth projects from the inner side of the finger; the thumb is distally truncate, with its horny unguis set nearest to the external margin. A similar unguis on the finger closes down within this.

The second gnathopods (1. *gn*<sup>2</sup>) are very like the corresponding limbs in *Apseudes*; the basos is bulky and twice as long as broad, the ischium so short as to be almost linear; the meros much shorter than the wrist, carrying one distal spine on the front margin; wrist long and narrow, ciliated on the back, and having a row of spines (four) with intervening solitary setæ in front; these spines gradually increase in size distally: the hand is about two thirds the length of the wrist, and, like it, is ciliated on the back, where it also has two small distal spines; in front is a graduated row of about four spines; the finger is furnished with one or two small denticles on its inner margin. In the specimen described one of the gnathopods of this pair had five spines in the row on the wrist and three on the hand, while the other had four on each of the joints.

In the first peræopods (1. *pp*<sup>1</sup>) the basos has a small spur near the base of the front margin and a large spur near the distal end of the dorsal margin; the ischium is very minute, the meros and carpus are equal in length, ciliated on both margins, with one or two stumpy spines on the front; the hand is large, flat, narrow, slightly curved, with



long cilia on the back, and short graduated spines with intervening cilia on the palm; the slender finger is set well back, and has an adjoining spine close to it, and of almost equal length.

The second peræopods (I. *prp*<sup>2</sup>) have the basos armed with two strong spurs on the upper margin.

The third peræopods (I. *prp*<sup>3</sup> and I. *prp*<sup>3\*</sup>) are distinguished by a group of finely biserrate spines upon the hand surrounding the base of the finger.

The following pair (I. *prp*<sup>4</sup>) have a spur on the back of the basos. Both this and the last pair (I. *prp*<sup>5</sup>) have the wrist longer than the hand, and fully ciliated on both margins, the hands straight; the finger slender and shorter than the hand.

The uropods have their peduncles curving a little inwards and distally dilated; the longer branch consists of eight or nine articulations, which are alternately longer or shorter, but the first two much stouter than those which follow; the shorter outer branch is made up of three very narrow articulations, of which the last is the longest.

The length of the animal (antennæ and uropods not included) is three tenths of an inch.

In the female the gnathopods differ greatly from those of the male, the sex which we have described, and are very like in form to the gnathopods which we have figured of *Sphyrapus anomalus*; the form of the segments of the pleon will at once distinguish it from that species.

This species was dredged by the 'Porcupine' in 1869, in 420 fathoms, to the south of Rockall, Station 23 a, lat. 56° 13' N., long. 14° 18' W.

### 3. SPHYRAPUS ANOMALUS, G. O. Sars. (Plate XXI. fig. II.)

1869. *Apseudes anomalus*, G. O. Sars, Undersøgelse over Christianiafjordens Dybvandsfauna, p. 45.

*Sphyrapus anomalus*, G. O. Sars, "Isopoda chelifera," Archiv for Mathem. og Naturvid. 1881, Bd. 7, p. 19.

Head and sides of peræon and pleon (II L) not spined. Last three segments of peræon much constricted anteriorly. First segment of body (head and first and second of peræon coalesced) smooth above, side margins evenly arched, produced in front into a large frontal lobe (II. c), terminating in a simple rostrum, the extremity of which is minutely nodulose; at the sides there is also the small ophthalmic process at the base of the upper antennæ. Pleon having the sides of the segments rounded, with a very minute point at hinder corner. Telson subtriangular (II. *urp*), extremity not produced, terminating obtusely, with a little dorsal tubercle bearing two small setæ. Upper antennæ (II. *aa*) having a secondary flagellum of three articulations. Lower antennæ having last joint of peduncle very long, the flagellum equal to it in length and composed of four articulations. First gnathopods (II. *gn*<sup>1</sup>) with the hand as long as the two preceding joints, elongated-ovate; finger and thumb long, forcipiform. Second gnatho-

poes (II. *gn*<sup>2</sup>) with wrist nearly twice as long as the hand, with two spines on distal portion of front, and one on dorsal margin; hand with five large and long spines on palm and two on the back; finger scarcely larger than the spines of hand, with three denticles on the edge. Uropods (II. *urp*) with the peduncle not extending beyond the telson; inner ramus long, with ten articulations, outer short, two-jointed.

Length 4 millim.

Sars thus describes the male:—

“*Mas adultus* a femina valde diversus. Corporis ejus forma multo magis elongata et angustior. Antennæ superiores longiores, flagello interno articulis 2 ultimis pedunculi junctis multo (fere duplo) longiore et 7-articulato, articulis omnibus ad apicem papillis olfactoriis numerosissimis et fasciculatis instructis. Partes masticationis quam in femina multo debiliores et fere omnino rudimentares. Pedum paria 2 anteriora forma ab iisdem feminae valde diversa et insolito modo elongata. Primum par corporis longitudinem, abdomine excepto, æquans, articulo basali permagno et tumido, sequentibus 2 valde elongatis et angustissimis junctis manu plus duplo longioribus, digitis valde forcipatis et intus dentatis; secundum etiam par longitudine insueta insigne et primo pari nonnihil longius, articulo basali fortissimo, penultimo maxime elongato triplam antecedentis assequente longitudinem, margine postico spinis 7 validis armato. Pedes abdominales structura fere eadem ac in femina sed multo longiores, setis pluribus et longioribus obsiti.

“*Mas junior* feminae corporis forma simillimus sed pedum 2 paribus anterioribus multo robustioribus et pedibus abdominalibus longioribus insignis.

“Habitat sat frequens in sinu Christianiensi ad Vallö in prof. 60–150 orgy. adque Holmestrand prof. 40–50 orgyar.”

*Sphyrapus anomalus* was not procured in the expeditions to which this memoir has especial reference. The description and figure of the female are derived from type specimens, for which we are indebted to Prof. G. O. Sars.

## Family II. TANAIIDÆ.

Animal produced, narrow, nearly parallel-sided; pleon scarcely, if at all, narrower than the peræon; there is no spiny armature of either peræon or pleon.

Carapace truncate in front, or with only a very minute and quite simple rostrum. Ocular alæ and eyes present or absent.

Upper antennæ simple, without any second flagellum, placed close together in the middle of the head; the single flagellum sometimes altogether absent, generally rudimentary, rarely well developed in female, but multiarticulate in male. Lower antennæ arising below the upper, not furnished with any scale, more slender than the upper pair; flagellum usually rudimentary, more rarely well developed.

Mandibles of varied structure in the different genera, but always without a palp.

First maxillæ furnished with a backward-directed palp, terminating in two setæ. Second maxillæ only represented by minute, rudimentary, naked lobes.

Maxillipeds with a falciform palp within the branchial chamber.

First gnathopods usually well developed, with the upper visible joint large and very tumid, the hand strong and chelate. In the male the whole limb, and especially the hand, assumes prodigious proportions, its base so encroaching upon neighbouring organs that in the adult the whole of the mouth-organs become more or less absorbed.

Second gnathopods not differing greatly in character from the peræopods, the three last joints not flattened, suited for progression.

Gnathopods not palpigerous.

Pleopods generally composed of a basal joint and two short setiferous lobes; rarely altogether absent.

Uropods either simple or furnished with two filaments; in the latter case the outer filament is always short, never consisting of more than three articulations, usually of one or two.

Fritz Müller was the first to observe the remarkable change in the characters of the adult male of certain members of this family, especially of the genus *Leptocheilia*, the genus to which the species called *Tanaïs dubius* by Fritz Müller belongs. He writes:—"In our *Tanaïs*, the young males up to the last change of skin preceding sexual maturity resemble the females, but then they undergo an important metamorphosis. Amongst other things, they lose the movable appendages of the mouth even to those which serve for the maintenance of the respiratory current; their intestine is always found empty, and they appear only to live for love. But what is most remarkable is, that they now appear under two different forms. Some acquire powerful, long-fingered, and very mobile chelæ, and, instead of the single olfactory filament of the female, have from 12 to 17 of these organs, which stand two or three together on each joint of the flagellum. The others retain the short thick form of the chelæ of the females; but, on the other hand, their antennæ are equipped with a far greater number of olfactory filaments, which stand in groups of from five to seven together. . . . I have examined thousands of them with the simple lens, and I have also examined many hundreds with the microscope, without finding any differences among the females, or any intermediate forms between the two kinds of males"<sup>1</sup>.

We are not aware that Fritz Müller's observations which led him to believe in two forms of the males in *Tanaïs* (*Leptocheilia*) have received confirmation from any subsequent writer except Dr. Dohrn, who has described two forms of the male in *Tanaïs dubius*<sup>2</sup>; but in this Prof. G. O. Sars has stated his opinion that the two males belong

<sup>1</sup> Fritz Müller, 'Facts and Arguments for Darwin' (Dallas), pp. 20-22.

<sup>2</sup> Dohrn, 'Untersuchungen über Bau und Entwicklung der Arthropoden.'

to different species, which, indeed, he assigns to distinct genera, holding that, while Dohrn's pl. xxvii. figs. 6-18 belong to the *Leptocheilia dubia* of Kröyer, pl. xxvii. fig. 17 (forma altera maris) must be distinguished, and accordingly naming it *Heterotanaïs anomalus*.

The subject is one of great interest, and we trust, at no distant period, will receive full elucidation.

It has been long known, as observed by Agassiz, Clark, and Hagen, that two distinct forms of the adult male exist in the freshwater Crayfish of the United States belonging the genus *Cambarus*; and Dr. Hagen suggested that of these forms the less differentiated, which in many respects much more closely resembled the female, were sterile, while the more highly developed and specialized form was the fertile male. Within the last few months an entirely new light has been thrown on the connection of these two forms by Mr. Walter Faxon<sup>1</sup>. He has kept in confinement the highly-specialized males together with females, and succeeded in breeding them freely. It will be well now to quote his own words:—"After pairing, three of the males moulted, and were thrown, while in a soft-shelled state, into alcohol, together with their exuviae. An examination of these specimens now reveals the fact that the soft-shelled specimens are all of the 'second form' (*i. e.* that which is less differentiated, and more like the female); their exuviae of the 'first form' (*i. e.* the highly specialized male). After attaining the 'first form,' and after pairing, the same individual has reverted to the 'second form.' It is now clear that we are not dealing with a case of true dimorphism, such as is well known among insects and plants, but it appears probable that the two forms of the Crayfish are alternating periods in the life of the individual, the 'first form' being assumed during the pairing-season, the 'second form' during the intervals between the pairing-seasons. It is to be inferred that before the animal is again capable of reproduction another moult will bring it again into the 'first form.' The fact that large collections made at one time and place often contain only one, or a great preponderance of one, form is now explained."

Mr. Faxon has also observed this same phenomenon in the case of another species, the *Cambarus propinquus*, Girard. He remarks, in conclusion, that the "males of extraordinary size which I have seen are all of the 'first form.'" Do these very old individuals cease to moult? Do they become permanently capable of reproduction?

Among the Cumacea the males do not attain their most distinctive characters until ready for breeding. While young, and up to a period when, from their size, we might suppose them to be mature, not only in the deficiency of those organs which, directly or indirectly, might be presumed to be connected with the generative functions, do they present features which assimilate to the female, but even in the form and armature of

<sup>1</sup> Faxon, "On the so-called Dimorphism in the Genus *Cambarus*," American Journal of Science, vol. xxvii., January 1884.

the carapace. The genus *Iphinoe* has a carapace crested with serræ, the pleon is greatly elongated in the female, and the lower antennæ are quite rudimentary, consisting of a basal and an extremely minute second joint; the pleon is without any pleopods. The adult male has no spines on the crest of the carapace; the lower antennæ are of extraordinary length, consisting of a well-developed five-jointed peduncle and a very long filament, which extends the whole length of the body, and is tucked away between the bases of the five pairs of largely-developed and well-ciliated pairs of swimming pleopods, and unquestionably are used as organs of sensation. Now, ordinarily, as the male approaches maturity, not in one moult, but in two or more, as is commonly the case in males among Amphipoda as well as Isopoda, the antennæ become large and the pleopods more developed; and examples are commonly found with imperfect pleopods present but naked, and the carapace still retaining the serrated crest characteristic of the female. At the final moult, when the pleopods attain maturity and are densely ciliated, and all other features of the specialized male are developed, the carapace loses its serrated crest. We have examined a large number of the species most common on our coast, *Iphinoe trispinosa*, Goodsir, but have not as yet met with a *fully-developed* male retaining the serræ of the carapace. My friend Prof. G. O. Sars<sup>1</sup>, however, has figured two forms of the male in an allied species, *Iphinoe serrata*, Norman, the one being the normal male with smooth carapace, the second (pl. xxviii. fig. 3) with a serrated crest, as in the female, constituting a "forma altera maris."

It is possible that this second form may correspond to the state of *Cambarus*, which, after the discharge of the sexual functions, moults, and retakes a form which approaches nearer to that of the female.

In the case of the Isopodan genera *Leptocheilia* and *Anceus* in the moult which precedes sexual intercourse, grasping-organs of enormous size are developed, which require so large a space of the animal's body for their articulation, that the mouth is to such an extent encroached upon, that the mandibles and maxillæ are altogether aborted, and the Crustacean thus loses all power of taking food. It seems obvious, therefore, that it cannot long exist in this condition, and that one of two things must take place. Either, having discharged its sexual functions, it must soon afterwards die, or it must moult again, and at that moult cast off its exaggerated limbs, and retake such as are of moderate dimensions, together with the mouth-organs. Mr. Faxon's discovery seems to give strength to a view that the latter of these events may take place in the life-history of these very interesting male Crustaceans.

<sup>1</sup> G. O. Sars, "Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna.—II. Middelhavets Cumaceer," Archiv for Matematik og Naturvidenskab, 1878.

*Synopsis of Genera of Tanaidæ.*

- A. Pleon not segmented, the first five segments coalesced. No pleopods. Uropods imperfectly biramous, external branch a conical process, inner 2-jointed, half as long as pleon. No eyes. Upper antennæ 4-jointed. Gnathopods with the basal portion of unusual form, composed of two distinct segments, oblong, tumid; hand small and weak . . . . . *Anarthrura*, G. O. Sars.
- B. Pleon segmented, but no pleopods.
- (a) Uropods imperfectly biramous, external branch tuberculiform, inner 2-jointed, minute. No eyes. Upper antennæ 4-jointed. Gnathopods of usual form. Hinder peræopods with basal joint constricted in its upper portion . . . . . *Strongylura*, G. O. Sars.
- (b) Uropods consisting of a single branch, a basal joint constituting the peduncle, and a second conical joint representing the branch. No eyes. Upper antennæ 4-jointed. Gnathopods strong, of the usual form. Peræopods slender, with a long finger terminating in a long nail; the anterior pairs more spined than the posterior, the latter not having the basal joint constricted above . . . . . *Tanaella*, n. g.
- (c) See *Pseudotanaïs* and *Leptognathia*, further on.
- C. Pleon segmented; pleopods only three pairs, which are densely setose. Uropods short, simple, the single branch composed of 2-3 joints. Eyes. Upper antennæ 3-jointed, with rudimentary flagellum. Hinder peræopods with a curved, hamate, strong finger . . . . . *Tanaïs*, Aud. & M.-Edw.
- D. Pleon segmented; pleopods all developed, but rudimentary, and not setose in female. No eyes.
- (a) Uropods very short, branched, inner 2- (♀), 3- (♂) jointed, outer 1- (♀), 3- (♂) jointed. Segments of peræon divided by deep indentations. Gnathopods alike in the sexes, of usual form. Peræopods with a long finger. "Mandibulæ bene evolutæ, acie serrulata, lamella secundaria m. dextræ valde exstante, processu molari sublaminiari, inermi" . . . . . *Cryptocope*, G. O. Sars.
- (b) Uropods moderately long, with unequal 2-jointed branches. Gnathopods not strong, of the usual form. Peræopods, hinder pairs with long finger. "Mandibulæ bene evolutæ, corpore sat elongato, processu molari cylindrico, apice truncato et denticulis acutis cincto" . . . . . *Haplocope*, G. O. Sars.
- E. Pleon segmented. Pleopods all developed and ciliated. No eye-lobes or eyes.
- (a) Pleopods developed and ciliated, or altogether absent in female. No ocular lobes; eyes present or absent. Upper antennæ 3-jointed, nearly alike in sexes. Gnathopods alike in

sexes; hand elongated, fingers narrow and acuminate. First pereopods with very long setiform finger. Hinder pereopods with penultimate joint expanded, and furnished with a knife-like spine, finger short. Uropods biramous, branches 2-jointed. Marsupial pouch formed of only two lobes . . . . .

*Pseudotanaïs*, G. O. Sars.

(b) Upper antennæ with three articulations in female; in male much larger, with a 4-jointed flagellum. Gnathopods nearly alike in both sexes, not very strong; hand narrow, fingers simple. First pereopods with a setiform finger; the hinder pairs short, with their basal joints very tumid. Uropods branched, each branch 1-2-jointed. Marsupial pouch of usual character, composed of eight laminae . . .

*Typhlotanaïs*, G. O. Sars.

(c) Upper antennæ in female 4-jointed, in male much larger; flagellum 4-jointed, with large fascicles of sensitive cilia. Gnathopods in female moderately strong, hand dilated, fingers strong, the thumb serrulated; in male more slender, with simple fingers. Pereopods little differing from each other, more or less spinous. Pleopods sometimes not developed in female. Uropods 2-branched, inner 2- (♀), 3- (♂) jointed; outer 1-2-jointed, or sometimes a mere tubercle . . . . .

*Leptognathia*, G. O. Sars.

F. Pleon segmented. Pleopods all developed and ciliated. Ocular lobes and eyes present.

(a) Upper antennæ in both sexes with a well-developed flagellum of about four joints, the flagellum in male with fascicles of sensitive cilia. Gnathopods of usual form in female; finger and thumb strong, the latter with tuberculated palm; in male largely developed, oblong, finger and thumb curved, forcipiform, both strongly toothed within. Pereopods much spined, the spines very variable in structure. Uropods 2-branched, inner multiarticulate (8-9-jointed); outer 2-jointed. No eyes . . . . .

*Alaotanaïs*, n. g.

(b) Upper antennæ 3-jointed in female, 6-jointed in male, and furnished with bundles of sensitive cilia. Gnathopods not very dissimilar in the sexes; hand oblong, fingers short. Pereopods of first pair slightly differing from the rest, with a long setiform finger; hinder pairs with first joint rather swollen. Uropods with two subequal 2-jointed branches . . . . .

*Paratanaïs*, Dana.

(c) Upper antennæ with three joints and rudimentary flagellum in female; narrow and elongated, with a more or less developed flagellum in male. Gnathopods in female of the usual structure; but in the male imperfectly chelate, without any finger, or the finger very short and immovable.

- Uropods biramous, inner branch 4-5-jointed, outer minute, but distinctly 2-jointed . . . . . *Heterotanais*, G. O. Sars. —
- (d) Upper antennæ conical, 3-jointed, and with a rudimentary flagellum in female, much more elongated and with a multiarticulate flagellum furnished with fascicles of sensitive cilia in male. Gnathopods in female strong, of the usual form; in male greatly elongated; hand very large, oblong, with elongated, curved, forcipiform fingers, the immovable one tuberculated on inner margin. Uropods 2-branched, inner branch multiarticulate, outer very small and rudimentary, consisting of only a single joint . . . . . *Leptochelia*, Dana. —

For full accounts of the foregoing genera, and especially for descriptions of the mandibles, which afford valuable diagnostic characters, reference should be made to Sars's Monograph.

The following is a list of all the species of this family which have, up to the present time, been discovered in the North Atlantic, under which title we include that portion of the ocean and its seas which lies north of lat. 35° N. :—

*List of Tanaidæ of the North Atlantic.*

Genus 1. TANAIIS, M.-Edwards, = *Crossurus*, H. Rathke.

1. *Tanais vittatus* (Rathke), = *Tanais tomentosus*, Krøyer.  
*Hab.* Britain; Denmark; Norway; N.E. America.
2. *T. cavolinii*, M.-Edw.  
*Hab.* Mediterranean and Adriatic.
3. *T. dulongii* (Audouin).  
*Hab.* Britain; Mediterranean.

Genus 2. LEPTOCHELIA, Dana.

1. *Leptochelia savignii* (Krøyer), = *Tanais edwardsii*, Krøyer, ♀, = *Leptocheliaalgicola*, Harger.  
*Hab.* Britain; Mediterranean; Madeira.
2. *L. neapolitana*, G. O. Sars.  
*Hab.* Naples.
3. *L. rapax*, Harger.  
*Hab.* N.E. America.
4. *L. ? filum* (Stimpson).  
*Hab.* N.E. America.
5. *L. dubia* (Krøyer), = *Leptochelia algicola*, Harger.  
*Hab.* Mediterranean; N.E. America; Brazil.

Genus 3. ALAOTANAIIS, Norman & Stebbing.

1. *Alaotanois serratispinosus*, Norman & Stebbing.  
*Hab.* North Atlantic; abyssal.



2. *A. hastiger*, Norman & Stebbing.  
*Hab.* North Atlantic; abyssal.
3. *A. levispinosus*, Norman & Stebbing.  
*Hab.* North Atlantic; abyssal.

## Genus 4. HETEROTANAI, G. O. Sars.

1. *Heterotanaïs ørstedii* (Krøyer), = *Tanaïs curculio*, Krøyer, ♂, = *Tanaïs balticus*, Fr. Müller, ♀,  
= *Tanaïs rhynchites*, Fr. Müller, ♂.  
*Hab.* Norway; Sweden; Denmark; Baltic Sea.
2. *H. limicola* (Harger).  
*Hab.* N.E. America.
3. *H. anomalus*, G. O. Sars, = *Tanaïs dubius* (forma altera maris), Dohrn.  
*Hab.* Mediterranean.

## Genus 5. PARATANAI, Dana.

1. *Paratanaïs batei*, G. O. Sars, = *Paratanaïs forcipatus*, Bate & Westwood (not *Tanaïs forcipatus*, Lilljeborg).  
*Hab.* Britain; Norway; Mediterranean.

## Genus 6. TYPHLOTANAI, G. O. Sars.

1. *Typhlotanaïs finmarchicus*, G. O. Sars.  
*Hab.* Finmark.
2. *T. assimilis*, G. O. Sars.  
*Hab.* Norway.
3. *T. tenuicornis*, G. O. Sars.  
*Hab.* Norway.
4. *T. microcheles*, G. O. Sars.  
*Hab.* Norway.
5. *T. cornutus* (G. O. Sars).  
*Hab.* Finmark.
6. *T. messinensis*, G. O. Sars.  
*Hab.* Mediterranean.
7. *T. brevicornis* (Lilljeborg).  
*Hab.* Norway; Denmark.
8. *T. æquiremis* (Lilljeborg), = *Tanaïs depressus*, G. O. Sars.  
*Hab.* Sweden; Norway.
9. *T. tenuimanus* (Lilljeborg).  
*Hab.* Norway.
10. *T. penicillatus*, G. O. Sars.  
*Hab.* Norway.

## Genus 7. LEPTOGNATHIA, G. O. Sars.

1. *Leptognathia longiremis* (Lilljeborg), = *Tanaïs islandicus*, G. O. Sars.  
*Hab.* Sweden; Norway; Iceland.

2. *L. breviremis* (Lilljeborg).  
*Hab.* Sweden; Norway.
3. *L. brevimana* (Lilljeborg).  
*Hab.* Sweden; Norway; Mediterranean.
4. *L. laticaudata*, G. O. Sars.  
*Hab.* Norway; Mediterranean.
5. *L. gracilis* (Kröyer).  
*Hab.* Spitzbergen.
6. *L. graciloides* (Lilljeborg).  
*Hab.* Sweden.
7. *L. rigida* (Bate & Westw.).  
*Hab.* Britain.
8. *L. cæca* (Harger).  
*Hab.* N.E. America.
9. *L. filiformis* (Lilljeborg).  
*Hab.* Sweden; Denmark; Norway.
10. *L. ? manca*, G. O. Sars.  
*Hab.* Norway.

## GENUS 8. PSEUDOTANAIS, G. O. Sars.

1. *Pseudotanaïs forcipatus* (Lilljeborg).  
*Hab.* Sweden; Denmark; Norway.
2. *P. macrocheles*, G. O. Sars.  
*Hab.* Norway; Finmark.
3. *P. lilljeborgii*, G. O. Sars.  
*Hab.* Finmark.
4. *P. mediterraneus*, G. O. Sars.  
*Hab.* Mediterranean.

## GENUS 9. CRYPTOCOPE, G. O. Sars.

1. *Cryptocope abbreviata* (G. O. Sars).  
*Hab.* Norway.
2. *C. vöringii* (G. O. Sars).  
*Hab.* North Atlantic, to the west of Norway; abyssal.

## GENUS 10. HAPLOCOPE, G. O. Sars.

1. *Haplocope angusta*, G. O. Sars.  
*Hab.* Norway.

## GENUS 11. STRONGYLURA, G. O. Sars.

1. *Strongylura cylindrata*, G. O. Sars.  
*Hab.* Norway.
2. *S. arctophylax*, Norman & Stebbing.  
*Hab.* Between Ireland and Rockall; abyssal.

## Genus 12. TANABELLA, Norman &amp; Stebbing.

1. *Tanaella unguicillata*, Norman & Stebbing.*Hab.* North Atlantic; abyssal.

## Genus 13. ANARTHURA, G. O. Sars.

1. *Anarthura simplex*, G. O. Sars.*Hab.* Norway.

Very few members of this family have as yet been noticed beyond the seas included in the North Atlantic; and when we see what Prof. G. O. Sars has done in Norway, we cannot doubt that a large number of forms remain to be discovered in British seas; indeed our own collections contain much material which awaits examination.

Genus 1. ALAOTANAIS<sup>1</sup>, n. g.

Animal elongated; carapace narrowed in front, without distinct ocular lobes. Pleon not wider than peræon, consisting of six segments, the first five subequal; the last usually more or less shield-shaped. No eyes.

Upper antennæ in female with three-jointed peduncle and flagellum of several joints; in the male flagellum furnished with tufts of sensitive cilia.

Mandibles strong, apices strongly toothed, molar process large and strong.

Maxillipeds present in the male.

Gnathopods in female of the usual form, but strongly built, the hand more or less twisted, the thumb toothed on the inner margin; in male greatly developed, in form as in *Leptocheilia*; hand very large, oblong, finger and thumb meeting only at the nails, the inner margins of both bearing strong, blunt teeth.

Peræopods spinous, the spines complex, and varying greatly in structure in the different species, thus affording excellent diagnostic characters.

All segments of the pleon developed, and furnished with ciliated pleopods.

Uropods two-branched, inner branch long and multiarticulate (8-9-jointed in the species known); outer branch 2-jointed.

Marsupial pouch composed of eight lamellæ, which are attached to the first four free segments of the body.

The species which belong to this genus are among the largest known forms, and live in the abyss of the ocean in from 370 to 1750 fathoms.

## 1. ALAOTANAIS SERRATISPINOSUS, n. sp. (Plate XXIII. fig. I., Plate XXIV. fig. I.)

Head with a small rostrum, and forming with the coalesced first peræon-segment a rather elongated carapace, widest in the middle, with the coxal regions of the first

<sup>1</sup> ἀλαός, blind, and Tanais.

gnathopods clearly defined, and the ocular processes in the form of minute isosceles triangles, projecting at the sides of the head between the upper and lower antennæ.

The first of the six following peræon-segments is much the shortest, and subcarinate anteriorly on the ventral surface; the rest are subequal.

The pleon has the first five segments subequal, and all of them shorter than the first free peræon-segment; the last (sixth) segment is longer than two of its predecessors, contracted behind the place of insertion of the uropods, and ending with two slight emarginations, separated from each other by a minute central apex.

The upper antennæ (XXIII. i. *aa*) lie close together, and, seen from above, completely conceal the lower, which are both shorter and more slender. The upper consists of seven articulations, the basal stout and long and slightly bulbous at its origin, the second rather more than one third the length of the first, the third still shorter and much thinner, and the first of the flagellum is longer than the three terminal joints combined. The lower antennæ are slightly longer than the first joint of the upper, and consist of nine articulations, all very slender except the short basal one; the third is the shortest of those belonging to the peduncle.

The first gnathopods (XXIII. i. *gn*<sup>1</sup>) have the first joint massive, and having the appearance, when viewed from below, of the human forearm near the elbow when folded so as to make the muscles stand well out; the next joint is indistinctly articulated, small, and concealed in some positions of the limb; the third is also small, scarcely visible except on the inner side of the limb; the wrist is large and subovate; the hand is also large and strong, with a powerful finger curving over the indented margin of the large thumb, and the horn-coloured nails of the finger and thumb overlap; the margin of the elongate thumb for some distance from the base is minutely beaded, the remainder of the thumb-edge slopes down to the upturned nail in five irregular blunt teeth, while two or three hairs spring from the side of the thumb; the inner margin of the finger is a little wavy where it passes over the beaded portion of the thumb-margin.

The six following pairs of walking-legs are all slight in structure, the coxal portion and ischium exceedingly small, the basos the longest portion of the limb, the wrist elegantly set with divergent rows of spines. The first three are differentiated from the last three, not merely by the usual tendency to point backwards, while the others tend to point forwards, but by remarkable microscopic differences of the hands and fingers. In the first three (i. *gn*<sup>2</sup>) the hand has a small straight dagger-like spine for its finger, ending in a more or less curved, very slender nail, and is almost hidden in a crowd of other spines, some almost as long as, and some shorter than, the finger, but all more or less finely serrated; the shortest of these spines is hooked at the end, and while smooth on one margin, has on the other six very pronounced teeth at right angles to its length; adjoining this is another and longer spine, conspicuously serrated on both edges; in the rest of the spines and in the finger itself the serration is of extreme tenuity. In the

last three pairs of legs (1. *ppp*<sup>4</sup>, 1. *ppp*<sup>4\*</sup>) the finger in like manner issues from a crowd of finely serrated spines, but it greatly exceeds them all in length, and is itself ornamented with a set of spines round its distal end, which shade off into lines of finer and finer spinelets running backwards towards its base; from the midst of the distal circlet of spines springs a long wavy spine-nail.

The first four free peræon-segments carry the small plates which are destined to be developed into the incubatory pouch.

The first five segments of the pleon bear each a pair of pleopods, consisting of a peduncle and two much ciliated branches, of which the inner has one pair of setæ springing from a prominent angle not far from the base of the plate (1. *plp* and 1. *plp*<sup>\*</sup>).

The uropods (1. *u*) spring from the widest portion of the last caudal segment, the peduncle not reaching beyond the termination of the segment; the inner ramus consists of nine articulations, and is about as long as the antennæ; the outer ramus is minute, and composed of two articulations, which are together not so long as the first of the inner filament. This latter has the alternate joints slightly ciliated.

Length of a large specimen 8.5 millim., or about one third of an inch.

This species was procured in the 'Porcupine' Expedition of 1869, Station 19, lat. 54° 53' N., long. 10° 56' W., 1360 fathoms, and Station 30, lat. 56° 24' N., long. 11° 49' W., 1380 fathoms; and, subsequently, by the 'Valorous,' Station 15, in lat. 56° 11' N., long. 37° 41' W., at a depth of 1450 fathoms, on a bottom of globigerine mud and pebbles.

## 2. *ALAOTANAI* *HASTIGER*, n. sp. (Plate XXIII. fig. II.)

This species comes very near to the last. It differs from it in having the eye-processes relatively larger, and in the massiveness of the hand and finger of the first gnathopods (II. *gn*<sup>1</sup>); in these organs all the parts are thickened and strengthened, without any proportionate increase in length. The effect of this is to make the inner edge of the thumb and finger overlap when closed all along the line, except for a small triangular space near the root of the thumb.

The uropods have the inner branch nine-, the outer two-jointed.

But the characters which at once distinguish this species from all others known to us are to be found in the microscopic armature of the limbs. All the peræopods are everywhere beset with long, very slender spines, the whole of which, under high powers, are found to be covered with minute prickles. There are no toothed spines, such as are found in *Alaotanaïs serratispinosus* (Pl. XXIII. fig. 1, *gn*<sup>2</sup>), the corresponding limb to which in *A. hastiger* has the finger long, narrow, and curved, and surrounded by a series of long, very slender spines, which all have the character of being beset irregularly all round with little prickles.

The hinder peræopods (II. *ppp*<sup>5</sup>) have a finger which, so far as we are aware, is absolutely unique in structure: the propodos is cleft at the end to some depth, the cleft

portions are rounded at the extremities and crenated or serrulated; the finger articulates at the base of the cleft, and is exactly spear-shaped, with serrated edges. A comparison of II. *ppp*<sup>5</sup> with the figures of the hinder peræopods of *Alaotanaïs serratispinosus* (I. *ppp*<sup>4</sup> and I. *ppp*<sup>4\*</sup>) will at once give characters sufficient to distinguish these species.

The carapace, seen from above, is much narrower in front than behind, and has a short rostrum; the sides are very flexuous, and present two constrictions (II. c).

The telson is shield-shaped; the upper corners of the shield (that is, the sides of the base of the telson) are very protuberant (II. p).

Length 5 millim.

A single specimen, a female, taken in the 'Valorous' Expedition, Station 9, lat. 59° 10' N., long. 50° 25' W., 1750 fathoms.

### 3. ALAOTANAÏS LÆVISPINOSUS, n. sp. (Plate XXIV. fig. II.)

*Male.* The carapace is similar to that of *Alaotanaïs serratispinosus*; the peræon-segments bear the same proportion to each other, but they are not to the same extent parallel-sided (II. d); viewed dorsally, a broad and deep constriction marks the separation of each from its successor, each segment being tumid laterally. The five first segments of the pleon are closely adpressed dorsally, with a very slight diminution in width from the first to the last. The sixth segment is a little narrower than its predecessors, and equal to two of them united in length. The uropoda are inserted about midway of the length; the remainder of the segment lying beyond them is much narrowed, with a rounded termination.

The upper antennæ (II. aa) have the first joint long and stout, with the usual row of hairs on the outer side near the distal end; the second joint is much shorter, but of nearly equal thickness; the third very short; the flagellum demands attention. The first joint, which is nearly as long as the last of the peduncle, has a remarkable protuberance on the underside, bearing a dense tuft of sensitive (olfactory?) cilia, which are longer than the first joint of the peduncle; the second joint is minute, and from its distal termination spring two long olfactory organs. They are nearly four times as long as the final articulation of the antenna, and are composed of many (apparently six) cylindrical, smooth joints. The last joint still smaller, with one or two cilia. The lower antennæ are not unlike in character to those of *L. serratispinosus*.

In a side view the cephalothorax is almost entirely hidden by the greatly developed gnathopods (II. l), the general character of which is similar to those of *Leptocheilia edwardsii*. The basos is a substantial joint as broad as it is long, the next insignificant, the following forms as it were a clasping-socket for the wrist, which is more than twice as long as the basos, though not so broad; in shape it is almost flask-like, the bent neck fitting into the meros. A narrow neck at the base of the hand (II. gn<sup>1</sup>) unites this portion of the limb to the wrist; the hand, with its greatly projected thumb, is consider-

ably longer than the extended wrist upon which it doubles back, the sinuosities of the meeting margins of the two to some extent corresponding. The wrist is ciliated on the upper margin, the hand finely serrated along the greater part of the curved margin which precedes the articulation of the finger; both thumb and finger have horn-coloured overlapping nails, but when the finger is closed there is still a large gap left between the greater extent of the inner margins; from that of the thumb there arises a small tooth, and then, nearer to the nail, a larger one with two cilia springing from its side; the finger is furnished with a small tooth nearly opposite to this one, and another nearer to its own base, so that the two teeth on the thumb are opposed to the cavity between the two teeth of the finger.

The second gnathopods and first and second peræopods are, as usual in this group, as nearly as possible alike to each other; it may be noticed, however, that in the second gnathopod (II. *gn*<sup>2</sup>) the basos is rather more curved, the bulky basos of the preceding gnathopod almost necessitating this differentiation. In the present species the basos is long and slender, the ischium minute, the meros much like the basos, but only half the length or less; the carpus still shorter, with two rows of spines in front diverging towards the distal end; the hand narrow, equal in length to the wrist, and similarly ornamented; the finger sharp, a little curved, not so long as the hand; two or three quite simple spines spring from the end of the hand, and are as long as the finger. In the three posterior peræopods (II. *pp*<sup>5</sup>) the meros is shorter, wider at the middle than at the base, and slightly decurrent, the slender curved finger with its fine sharp nail is even longer than the hand, and the spines at the end of the hand are short and flattened and simple, not one third as long as the fingers; none of the spines of the peræopods in this species are either serrulate, dentate, or covered with prickles.

The pleopods (II. *plp*) have very long and densely plumose setæ.

The uropods (II. *urp*), on a moderately stout peduncle, carry a long multiarticulate inner ramus and a short two-jointed outer one. Of the two minute joints of which the shorter ramus consists the second is twice as large as the first, but the total length scarcely exceeds that of the first articulation of the longer ramus; the latter is imperfect, but six articulations remain.

All along the back of the animal, from head to telson, minute upright hairs are visible.

Length 5·5 millim.

A single specimen, an adult male, was taken in the 'Porcupine' Expedition, 1869, Station 1, lat. 51° 51' N., long. 11° 50' W., in 370 fathoms—that is, off Valentia, in the south-west of Ireland.

Genus 2, *STRONGYLURA*, G. O. Sars.

Animal elongated, subcylindrical, slightly narrower in the middle; integument very hard. Cephalic segment moderately large, attenuated in front, without distinct ocular lobes. Pleon larger than usual, perfectly cylindrical, smooth, composed of six evenly arched segments, the last cupuliform. No eyes.

Upper antennæ in female 4-jointed. Lower antennæ much more slender, distinctly 6-jointed, and having a rudimentary flagellum ("flagello rudimentario excepto, distincte 6-articulatæ").

Mandibles well developed, with the edge curved inwards and sparingly denticulated: molar process moderately large, laminar, finely crenulated apically.

Gnathopods strong, formed as usual.

Ambulatory feet slender and long, the fingers narrow; hinder pairs slightly different, more spined, and with the basal joint much constricted in its upper part.

Pleopods entirely absent in the female.

Uropods very short, biramous; external branch very minute, tuberculiform.

The above characters constitute the definition of the genus as given by its author.

*STRONGYLURA ARCTOPHYLAX*, n. sp. (Plate XXIV. fig. III.)

This is a neat compact little species with shining hard integument. The carapace is comparatively short (III. D), the anterior margin forms an obtuse angle. The first free peræon-segment is as wide as the carapace at its widest part; the succeeding five segments gradually diminish in width backwards, the last being of the same width as the first five pleon-segments. These are short, close-set, and with their edges folded under the animal, so as to be visible ventrally (III. E), where there is no sign of any pleopods. The sixth segment of the pleon is as long as three of those that precede it, and as broad or even a little broader in the anterior portion; but the latter half narrows rapidly to the rounded termination. The uropods are set on well underneath on each side of the almost circular anal opening.

The upper antennæ (III. a.s) have the large first joint of no very great length, considerably wider at the base than distally; the second joint is not half the length of the first, and increases in width distally; the third is half the length of the second and narrower; the flagellum appears to be a single conical piece, equalling in length the two preceding joints of the peduncle, and ending in two long setæ.

The lower antennæ (III. a.i) are, as usual, much more slender than the upper, but their length is not greatly inferior; the last joint of the peduncle is longer than its two predecessors combined (the latter being short); it is thin and much curved; from it springs the uniaarticulate flagellum, terminating in one long and two short setæ; in other respects resembling that of the upper antennæ, but being of much smaller size.



The first gnathopods (III. *gn*<sup>1</sup>) are compact, with a certain uniform squareness about all the joints; the basos, meros, and carpus are subequal in length; the two latter lie closely side by side; the hand carries a thick short finger clasping closely down upon a thick short thumb; both end in stumpy horn-coloured nails.

The following six pairs of legs are very slender and small, divided, as in other Tanaidæ, into two sets of three. In the first set (III. *gn*<sup>2</sup>) the basos is rather longer, in the second (III. *prp*<sup>4</sup>) it is distally rather thicker. In all of them the ischium is very small, the meros and carpus about equal in length; the propodos thinner and longer than either, with finely pointed curved fingers. At the distal end of the hand there is a curious short serrate spine above the convex upperside of the finger.

The uropoda (III. *pl.* and III. *pl.*<sup>\*</sup>) are very short, and consist of a short thick peduncle with a two-jointed inner ramus diminishing in thickness distally but not to a fine point; the first joint is about the same length as the peduncle, the second shorter, terminating in four long divergent hairs; the outer ramus is unarticulate, rather longer than the first joint of the inner ramus and terminating in one or two hairs.

Length 4 millim.

A single specimen was dredged in the 'Porcupine' expedition of 1869, midway between Ireland and Rockall, in 1380 fathoms. (Station 30, lat. 56° 24' N., long. 11° 49' W.)

The foregoing description was written years ago, long before the publication of Prof. G. O. Sars's monograph. The genus which we had described for it is undoubtedly the same as *Strongylura*, to which therefore we assign it, and it is not improbable that our *S. arctophylax* may ultimately prove to be the same as the typical *S. cylindrata*; but apparently that species is of more elongate and drawn-out form: "Corpus gracile, plus 8-ies longius quam latius. . . . Corpus posticum tertiam corporis longitudinis partem nonnihil superans, segmento terminali antecedentibus 4 junctis longitudine æquali." We therefore deem it better to retain the name we had proposed, as further comparison may show other distinctive features; moreover, there are apparently differences in the antennæ, and the outer branch of the uropods, though consisting of only a single joint, could scarcely, we think, have been designated by Prof. Sars as tuberculiform. *Strongylura cylindrata* was taken on the coast of West Norway.

### Genus 3. TANAEELLA, n. g.

Animal elongated, subcylindrical, nearly parallel-sided; integument very hard, polished and shining. Carapace moderately large, constricted slightly in the middle, widening again forwards, slightly rostrate; no distinct ocular lobes. Pleon subequal to last three segments of peræon, perfectly cylindrical, smooth, composed of six evenly arched segments; the telson equal to at least four in length, cupuliform.

Eyes none.

Upper antennæ in female strongly built, four-jointed; lower pair more slender, seven-jointed, the last rudimentary.

Gnathopods strong, of the usual form.

Peræopods slender, with a long finger, terminating in a long nail; the anterior pairs more spined than the posterior, the latter not having the basos markedly constricted in its upper half.

No pleopods.

Uropods conical, having only a single branch without any vestige of an outer one, composed of two joints. The first represents the peduncle, the second the branch; the latter is nearly twice as long as the former.

The only other genus of this family which has the uropods consisting of a single branch is *Tanaïs*, from which this is at once distinguished by the absence of pleopods and other characters.

To *Strongylura* it has perhaps the closest affinity, and we have followed the wording of the description of that genus, as given by Sars and quoted in this paper, in order to bring out the points of difference. In *Strongylura* the uropods are two-branched; in *Tanaella* they are one-branched.

*TANAELLA* UNGUICILLATA, n. sp. (Plate XXIV. fig. iv.)

The rostrum (IV. D) is short and not acute; the eye-processes are difficult to observe in the single specimen obtained; they seem to be set back in a kind of socket. The carapace is longer than wide, the hinder portion bulging laterally, so that the diameter is there greater than in the succeeding segments of the parallel-sided peræon. Of the free peræon-segments the sixth is scarcely longer than the first, the second is longer than either, and the third, fourth, and fifth longer than the second. The first five pleon-segments increase very slightly in width distally. The last segment is also, in its anterior portion, rather wider than the fifth, and in length fully equals that of the four preceding taken together; from the attachment of the uropods it narrows rapidly to an almost pointed termination.

The upper antennæ (IV. L\*) are short and thick, the first joint shorter than usual, stout and curved; the second is shorter, and thick in proportion to its length, and is furnished at its end with a stiff spine, which lies parallel with and close to the short third joint, which it just equals in length; flagellum uniarticulate, short and conical, ending in a tuft of setæ.

The lower antennæ (IV. L\*) are thin, but not much shorter than the upper; the first joint not distinguishable in the specimen examined, the second and third short, the fourth longer, the fifth rather longer than the fourth, with two long hairs near the end; the flagellum consists of one rather long and thin articulation, followed by a minute tufted one.

The first gnathopods (IV. L\*) have the basos with the rounded lobe, so usual in this group, greatly developed; the meros lies almost entirely on the inner side of the wrist; the wrist is large and bulky; the hand united to the wrist by a thick neck, the rest of the joint being broad and stout, with a short broad thumb, the inner margin of which is minutely toothed, and at about one third of its length slopes down rather suddenly to the little upturned nail; there are two or three small teeth on the inner margin of the finger, notably one near its root.

The following six legs are slightly built, with long slender nails. In the first three pairs the finger (IV. *pp*<sup>1</sup>) exceeds the hand in length, and is minutely fringed or pectinate, and rises from the midst of spines similarly ornamented. In the last three pairs the finger (IV. *pp*<sup>3</sup>) is not quite so long as the hand, and opposite to its concave curvature there is, at the distal end of the hand, a short serrated slightly curved spine. The short meros and the longer carpus have each a long incurved spine at the distal end.

The uropods (IV. PL) consist of a short rather stout peduncle and a single conical unarticulate ramus, which is more than twice as long as the peduncle, and bears two long setæ at the blunted apex.

There is no trace of pleopods on the first five segments of the pleon; these segments bulge out ventrally.

Length 3 millim.

The type and only specimen was dredged in 1869 by the 'Porcupine' in 96 fathoms, on the slope of the English Channel. (Station 35, lat. 49° 7' N., long. 10° 57' W.)

## Tribe II. *FLABELLIFERA*, G. O. Sars.

### Family ANTHURIDÆ.

Animal greatly elongated, narrow, nearly cylindrical or depressed; head much shorter than following segment. Mouth-organs adapted for suction; first gnathopods the larger, subchelate; second gnathopods and first peræopods not very unlike in general form to the first gnathopods, but more slender; remaining peræopods adapted for walking. First pleopods large, expanded, and covering (generally in female) the remaining pleopods. Telson linguiform; uropods, outer branch one-jointed, and so articulated as to arch more or less over the back of telson, inner branch two-jointed.

This family consists of Isopods of remarkably elongated form, composed of segments which are cylindrical or slightly depressed, those of the peræon (except, in some cases, the last) being much longer than they are broad. The head is more or less quadrate, shorter than the following segment, and having the eyes, when present, at the anterior angles. The pleon sometimes has all the segments, except the telson, completely, at

other times partially coalesced; at other times, again, they are all distinctly separated. The telson is linguiform, rarely lanceolate, with the termination rounded or truncate.

The upper antennæ are situated at the exterior angle of the head, and the lower take a very unusual position in having their bases closely appressed together, and occupying a central position between and below the origin of the upper pair. The upper pair consist of a three-jointed peduncle and short, sometimes rudimentary, flagellum in the female; but in the male the flagellum is, in some species, enormously developed into a long brush-like appendage as long as half the animal, and composed of very numerous and thick articulations, which are densely setose. The lower antennæ consist of a five-jointed peduncle and short flagellum. The mouth-organs are all formed to serve purposes of perforation and of suction, and not of mastication; these organs, as they exist in *Cyathura carinata*, Kröyer, have been minutely and admirably described and figured by Schiödte<sup>1</sup>. In this and allied forms the mandible is apparently used as a saw, the outer portion of the jaw being strong, slightly dentate at the extremity, and giving support to a semicircular under portion, which is finely serrate on its sharp edge, while the first maxillæ are somewhat pyriform, the base being the thicker portion, and the extremity is again moderately expanded and terminates in rows of four or five teeth. But in a second group of this family (*Paranthura*) the mandible is aciculate, terminating in a single styliiform point, with the under portion of delicate structure and sharp unserrated edge, the whole being evidently used as a lancet; and the first maxillæ are spear-like, very long and slender, with the distal edges finely toothed.

The first gnathopods have strongly developed basos and ischium, the meros short but wide, the carpus minute and triangular; the propodos pear-shaped or more or less triangular, its base very wide, attached to the carpus, but its upper portion, as a rounded lobe, rests on and finds support from a cup-like receptacle in the expanded portion of the meros. The dactylus is usually as long as the palm of the propodos, on which it closes.

The second gnathopods and first peræopods are usually alike in structure, and in general form resemble the first gnathopods, but are much more slender. The remaining peræopods are constructed for walking.

The first pleopods have the outer rami greatly developed, and these together form a kind of operculum, which in the female reaches to the extremity of the five first segments of the pleon, and conceals and protects the remaining pleopods which lie beneath it.

The uropods have an arrangement which is unique among Crustacea, inasmuch as the outer ramus, which has only a single joint, instead of, as is usually the case, arising

<sup>1</sup> "Krebsdyrenes Sugemund," Naturhistorisk Tidsskrift, 3 R. 10 B. (1875), p. 211, tab. iv.

at the side of and underlying the telson, is here so articulated that it more or less arches over and partially conceals the telson; the inner branch consists of two broad joints and underlies the telson. It is to the fancied resemblance of this peculiarly constructed tail to the opening of the petals of a flower that we owe the name of the genus, *Anthura* (*ἄνθος*, a flower; *οὐρά*, a tail). Bate and Westwood, remarking on the structure, write:—"The apparatus when open forms a concave cup-like disc; and when at rest, from being affixed vertically, the outer plate falls back and shuts down upon the dorsum of the middle tail-plate, like the two wings of a closed triptych."

*Synopsis of Genera of Anthuridae.*

Section A. Labium terminating in two rather broad rounded lobes. Mandibles having the jaw furnished with a somewhat falcate projecting process below, well arched and terminating in two or three blunt inconspicuous teeth above; a thin blade with semicircular saw-toothed edge unites the falcate process below and the arching termination of the mandible above; this blade, when highly magnified, is seen to have a serrated edge: the serrations are usually few, about five, but in the genus *Cyathura* they are very numerous, and here the general appearance reminds us strongly of an arc of a circular saw. First maxillæ simple, without exterior limb or palp, subpyriform; rounded below, then gradually tapering, but ultimately slightly expanding and bending forwards, terminate in conspicuous and well-developed teeth. Second maxillæ without palp, with the distal extremity slightly cleft. Maxillipeds consisting of two to five joints, which are broad and flattened.

1. Five earlier segments of pleon coalesced into a single segment in female, distinct in male. Flagella of antennæ of both pairs in female few-jointed, of upper pair in male greatly developed and multiarticulate. Maxillipeds two-jointed . . . . . *Anthura*, Leach.
2. Five earlier segments of pleon coalesced into a single segment (at least dorsally) in the female. Flagella of antennæ of both pairs rudimentary (that of the upper pair in the male not greatly developed?). Maxillipeds three-jointed . . . . . *Cyathura*<sup>1</sup>, n. g.
3. Segments of pleon very short, but distinct in female. Flagella of antennæ of both pairs many-jointed, of upper pair in the male developed into a remarkable brush-like organ nearly equal in length to half that of the animal, and composed of very numerous, short, broad, and densely ciliated joints. Maxillipeds five-jointed, second joint very short . . . . . *Anthelura*<sup>2</sup>, n. g.
4. Segments of pleon quite distinct and fully half as long as broad; pleopods alike, the first pair not covering or concealing any of the

<sup>1</sup> *κῦθος*, a cup, and *οὐρά*, a tail.

<sup>2</sup> *ἀνθήλη*, a blossom, and *οὐρά*, a tail.

following. Uropods with outer branch long and narrow, not arching over the telson; telson narrow and lanceolate. The whole animal greatly drawn out and vermiform. Flagella of antennæ of both pairs many-jointed. Maxillipeds five-jointed . . . . . *Hyssura*<sup>1</sup>, n. g.

Section B. Labium gradually tapering and acuminate, terminating in two points. Mandibles without teeth, forming an acutely-pointed lancet-like organ, and the saw-like process characteristic of the genera of Section A is here represented by the expanding lobes of the base of the lancet, which form a channel through which, when the incision has been made, the liquid may be sucked. First maxillæ take the form of a greatly produced, very narrow, spear-like organ, which towards the point is channelled on one side and finely serrated at the margins, thus constituting an admirably adapted instrument for deeply probing the wound where the lancet-like and more cutting mandible has first made the incision. Maxillipeds are of great length, and consist of three or four joints, of which the first is more than twice the length of the rest combined.

5. Segments of pleon distinct in the female. Lower antennæ with a rudimentary flagellum. Upper pair having the flagellum in the male greatly developed into a long brush-like organ . . . . . [Westw. *Paranthura*, Bate &
6. Segments of pleon distinct in the female. Antennæ of both pairs in both sexes with many-jointed flagella (that of the upper pair not greatly developed in the male?) . . . . . *Calathura*<sup>2</sup>, n. g.

#### Genus 1. ANTHURA.

##### 1. ANTHURA GRACILIS (Montagu). (Plate XXV. figs. III, IV.)

1808. *Oniscus gracilis*, Montagu, Trans. Linn. Soc. ix. p. 103, pl. v. fig. 6.

1813. *Anthura gracilis*, Leach, Edinb. Encyclop. vii. p. 404; Trans. Linn. Soc. xi. (1815) p. 366; Desmarest, Consid. Crustac. p. 291, pl. xlvi. fig. 13; Guérin-Ménéville, Icon. Reg. Anim. pl. xxx. fig. 6; White, Pop. Hist. Brit. Crust. p. 225, pl. xii. fig. 4; Gosse, Marine Zoology, i. p. 248; Bate and Westwood, Brit. Sessile-eyed Crust. ii. p. 160.

Segments of peræon with well-marked dorso-lateral keels; telson abruptly truncate and crenulated at the extremity.

Head square, slightly produced at the centre and sides of the front margin.

Peræon: first segment the longest, second to fifth subequal, sixth rather shorter, seventh shortest of all, all bearing keels on each side on the back, and having a central longitudinal keel on the ventral surface.

Pleon in female having the five first segments indistinguishable and coalesced into a single segment, which is equal in length to the last segment of the peræon. In the

<sup>1</sup> ὄσος, a javelin, and οὐρά, a tail.

<sup>2</sup> κάλαθος, a cup, and οὐρά, a tail.

male (III. D, ♂, and III. PL. V, ♂) these segments are much more developed and distinct, though the segmentation is incomplete, and are equal in length to the last two segments of the peræon.

Telson and uropods so constructed and uniting as to resemble nearly a cylinder, with one side (the dorsal), as it were, cut obliquely away. The telson has the apex truncated, and is of the same length as the inner branch of uropods. Outer branches of uropods nearly meeting at their bases dorsally, broadly lanceolate, curved, rather longer than the first joint of the inner branch; end of telson and margin of both branches of uropods crenated.

Eyes distinct, black.

Antennæ: upper in female shorter than lower, with a flagellum consisting of one long articulation, which terminates in a tuft of setæ; lower with second joint of peduncle greatly expanded distally; third very small, fourth rather longer, fifth equal length of third, flagellum four-jointed. In male (III. D, ♂) the upper antennæ are much more developed, and as long as the two first segments of the body, and furnished with a thick flagellum of numerous articulations.

First gnathopods (IV. *gn*<sup>1</sup> ♀) with an ovate or pyriform hand, which has the upper proximal portion well rounded; palm with a well-developed process projecting forwards near the base; finger strong, unguiculated, the unguiculus black; front margin of wrist, hand, and finger crenulated.

Second gnathopods with the two upper joints subequal, the third short, strongly lobed posteriorly; fourth very minute, triangular; fifth as long as upper joints, and equal to third and fourth together, nearly parallel-sided; front margin pectinated, and bearing a single distal spine; finger rather more than half length of hand, strong, apparently not capable of closing on the hand, itself unguiculate and having a spine at the base of the unguiculus.

Last peræopods with basos and ischium subequal, two following joints rather shorter and subequal to each other; fifth as long as upper joints, and having the palm pectinated and bearing a single distal spine; finger half as long as fifth, unguiculate, a spine at the base of the unguiculus.

Length 8 millim.

Coasts of Devon and Cornwall. The specimens examined were found by T. R. R. S. at Torquay.

It will be seen from the foregoing description that the male, which was not previously known, differs from the female in the greatly developed flagellum of the upper antennæ and in the more produced and segmental character of the pleon. We think it probable that the male has not fully attained its several characters, and that when quite mature the antennæ would have the flagella even more developed and ciliated.

## 2. ANTHURA TENUIS (Harger).

1878. *Ptilanthura tenuis*, Harger, Amer. Journ. Sci. ser. 3, vol. xv. p. 377; Proc. Unit. Stat. Nat. Mus. 1879, vol. ii. p. 162; Report Unit. Stat. Commis. Fish and Fisheries, pt. vi. for 1878 (published 1881), p. 406, pl. xi. fig. 71, *a-e*.

It is probable that the male of *Anthura gracilis* which we have just described and figured is the immature animal, and that, after the exuviation which should bring it to its perfect state, the upper antennæ would have a plumose flagellum. If that supposition be correct, then it would bear a great resemblance to Harger's figure of *Ptilanthura tenuis*; moreover, *A. gracilis* has slight depressions on the back of the segments, as described and figured by Harger, and, although that author does not mention the keeled character of the margins of the peræon-segments, it seems to be shown in the figure. But, notwithstanding these resemblances, *A. tenuis* is clearly distinguished by the form of the telson, which is described as "about as long as preceding five segments, elongate-ovate and obtusely pointed behind." Mr. Harger's description of the palp of the mandible being of only one joint is probably a mistake; the palp might easily have been damaged in dissection and produced a false impression.

## Genus 2. CYATHURA.

## CYATHURA CARINATA (Kröyer). (Plate XXVII. fig. III.)

1844. ? *Anthura gracilis*, DeKay, Zool. New York. Crust. p. 44, pl. ix. fig. 34 (but not *A. gracilis*, Montagu).
1847. *Anthura carinata*, Kröyer, Naturhist. Tidssk. 2 ser. ii. p. 402, and Voyage en Scand. pl. xxvii. fig. 3; Schiödte, Krebs. Sugem., Naturh. Tidssk. 3 ser. x. p. 211, pl. iv. figs. 1-14, and Ann. Nat. Hist. 4 ser. xviii. (1876) p. 253; Meinert, Crust. Amphip. et Decap. Daniæ, Naturhist. Tidss. 3 ser. xi. (1877) p. 77, and xii. (1880) p. 470.
1856. *Anthura polita*, Stimpson, Proc. Acad. Nat. Sci. Phil. vol. vii. p. 393; Harger, Proc. Unit. Stat. Nat. Mus. 1879, vol. ii. p. 162; Harger, Report Marine Isopoda of New England &c., Rep. Unit. Stat. Comm. Fish and Fisheries, pt. vi. for 1878, p. 398, pl. xi. figs. 68, 69.
1874. *Anthura brunnea*, Harger, Rep. Unit. Stat. Comm. Fish and Fisheries, pt. I, p. 572 (278); Verrill, l. c. pt. 1, p. 426 (132).

Body of uniform width throughout. Head broader than long, with slight central and lateral projections in front.

Peræon: first segment the longest; second to fifth subequal to each other, and scarcely longer than broad, and of equal breadth throughout; sixth and seventh equal to each other, and rather shorter than the preceding. The peræon is keeled below, and the third to the fifth segments have a slight pit on the anterior part of their dorsal surface.

Pleon with the five first segments, in the female at any rate, completely coalesced into a single segment, which is equal to the last of the peræon in length; sixth segment very minute.



The telson (III. *tl.*) is ovate, but very obtusely angled at its termination. Uropods having the outer branches arching but not nearly meeting over the telson, transversely lanceolate, curved; inner branches longer than telson, their second joint broader than long; the margins of telson and both branches of uropods are not serrulated, but fringed with feathered cilia.

Eyes minute, black.

Antennæ: upper (III. *as*) having first joint of peduncle very broad, second as long as the first, but much narrower, having long setæ on the outer margin; third two thirds as long as the second; flagellum minute, about half the length of the last joint of the peduncle, and consisting of four very minute articulations. Lower antennæ (III. *ai*) with a broad and thick peduncle and a rudimentary flagellum; the second joint of peduncle not markedly widened at the extremity; the three following joints thick, subequal, but the last rather the longest; flagellum not half the length of the last joint of peduncle.

First gnathopods (III. *gn'*) strongly formed; two upper joints very massive, the first broader than long; meros of the usual cup-shaped form characteristic of the family; carpus minute, triangular, with the distal margin produced into a setose lobe; hand pyriform, the palm bearing a tubercular process near the middle; finger simple. The margin of the wrist and palm of the hand are setose.

Second gnathopods very setose; carpus small, and narrower (as usual) than meros, but produced below into a rounded lobe; hand broad, much curved; palm finely crenated, and carrying a distal spine, which, when seen under a high power, is found to have its further margin beautifully pectinated; finger strong, as long as palm (on which, however, it does not seem capable of closing), unguiculate; the unguiculus minute, surrounded at its base with a tuft of hair.

Last pereopods setose; carpus very short; propodos equal in length to two preceding joints, and twice as long as broad, front margin minutely crenulated and furnished with a distal spine; finger strong, round, about two thirds as long as propodos, furnished with a minute unguiculus, which is surrounded with a tuft of hairs.

Length 20 millim.

*Habitat.* On the coasts of New Jersey, Connecticut, and Massachusetts (*Harger and Verrill*); Greenland (*Krøyer*); Denmark (*Schjødte and Meinert*).

Our description is drawn up from specimens kindly sent to us, named *Anthura brunnea*, by Mr. S. I. Smith, the talented carcinologist of Yale College. There can be no doubt, we think, that it is the *A. carinata* of Krøyer. Harger calls attention to certain points in which the description of Krøyer does not seem to agree with the American specimens; but if the figures of the parts so described which are given in the 'Voyage en Scandinavie' &c. be examined, the apparent discrepancies seem to disappear.

## Genus 3. ANTHELURA.

## 1. ANTHELURA ELONGATA (Norman). (Plate XXV. figs. 1., II.)

*Paranthura elongata*, Norman, MS. in Proc. Roy. Soc. No. 125, p. 157.

Head with the sides rather rounded. Second segment of peræon narrowed, but not greatly constricted behind; the four following segments of nearly equal width, smooth; last fully half the length of penultimate, which latter is much shorter than the fifth. Pleon (fig. II. PL. ♀) with all the segments well defined; length of pleon, exclusive of telson, equal to that of the two last peræon-segments. Antennæ (fig. II. c. ♀) having the peduncles of both pairs flattened; last joint of peduncle of inferior antennæ not larger than the inner margin of the third joint; second joint triangular, its inner margin straight and touching the corresponding part of the opposite limb; flagella of both pairs many-jointed.

First gnathopods (fig. I.  $gn^1$  and  $gn^{1*}$ ) not strong; hand not large, pyriform, attached by half its underside (not by its base) to the upper face of the triangular wrist, the infero-distal extremity of which stretches forward to receive it; palm occupying the whole of the unattached portion of the margin of the hand, but, from the peculiar mode of attachment of that joint, only equal to half of its total length, having a few scattered setæ; finger slender, much longer than the palm, and impinging, when closed, upon the wrist; meros very short, but greatly produced on the back into a sheath-like process, which is strongly angled above and distally hollowed to receive the rounded free base of the hand.

Second gnathopods (fig. I.  $gn^2$ ) and first peræopods (fig. I.  $pp^1$ ) resembling in general character the first gnathopod, but smaller, and the back of the sheath-formed meros rounded and not angled. Remaining peræopods having all their joints broad and flattened; hand and nail subequal (fig. I.  $pp^5$ ), and only slightly longer than the wrist, the four last joints being subequal in length, hand having two and the wrist three to five long subequal spines on the front margin.

Uropods (fig. II. PL. ♀) with the outer branch arching over the telson, its margin crenated; inner branch scarcely longer than the telson, broadly rounded at the extremity; the second joint at least as long as the basal portion; margins plain. Telson narrowly linguiform, and rounded at the extremity.

The male has the upper antennæ (fig. I. c. ♂) greatly developed, as long as the four first segments of the body; the flagellum remarkably thick, and looking out of all proportion to the peduncle which supports it, composed of very numerous short joints, which are densely ciliated, so that the entire member forms a long brush. All the legs are more elongated and slender than the corresponding parts in the female, though in general structure closely resembling them. The first pleopods (fig. I. PL. L. ♂) are fringed with long and beautifully plumose setæ, and do not close so tightly over the more

fully developed succeeding pleopods. The extremities of the uropods are also setose, and it is evident that the entire structure of the animal is more adapted for active locomotion than that of the female.

Length of female 13 millim. (or half an inch), of male 17 millim.

Taken by the 'Porcupine' expedition in 1870, in 740 fathoms, off the coast of Portugal. (Station 17 *a*, lat. 39° 39' N., long. 9° 39' W.)

The specific name has reference to the elongated pleon with its well-marked segmentation.

2. *ANTHELURA ABYSSORUM*, n. sp. (Plate XXVII. fig. II.)

Head and peræon of nearly equal width throughout; second segment of the latter scarcely at all constricted behind. The whole of the segments smooth above, and devoid of all furrowing and pitting; last segment of peræon half as long as the preceding segments of pleon (II. PL. D), very clearly defined, and (exclusive of telson) subequal in length to penultimate segment of peræon.

The antennæ (II. C, D) have the joints of the peduncle in both pairs flattened, the lower pair touching each other with the compressed inner margins, and appearing between the upper pair, as in *Anthelura elongata*; flagella of both pairs many-jointed.

First gnathopods (II. *gn*<sup>1</sup>) having basos short and very thick; ischium scarcely longer, and not so broad; cup of meros well rounded; carpus small as usual, bearing five or six spine-like setæ; hand about twice as long as greatest breadth; palm concave, bearing about eight slender spine-like setæ.

Second gnathopods (II. *gn*<sup>2</sup>) having basos and ischium more slender than in first pair; meros of similar form; carpus edged with several spine-like setæ and one spine; hand elongate-ovate, palm with three spines and a few setæ.

Last pereopods (II. *pp*<sup>5</sup>) having the propodos half as long again as the carpus, and the dactylos subequal to the carpus; carpus and propodos each furnished with two forked spines on their anterior margin.

First pleopods large, covering the whole of the remaining pleopods, against which they are closely pressed.

Uropods (II. PL. D and II. PL. L) with outer and upper plates wide apart dorsally, broadly triangular or spear-shaped, longer than wide, and as long or nearly as long as the inner plate, which is very similar in form but narrower, with well-rounded extremity; both are tipped with a few setæ, which are, however, very easily abraded.

Telson much depressed, broadly lanceolate, apex rather acute, about equal in length to the uropods.

Length 9 millim. (or about three sixteenths of an inch).

Dredged by H.M.S. 'Valorous' in 1875 (Station 8), in 1750 fathoms, near the entrance of Davis Strait, lat. 59° 10' N., long. 50° 25' W.

The forked spines which are found on the hand of the last peræopods in this species are of unusual character. Somewhat similar cleft spines occur on the wrist and hand of second gnathopods of *A. elongata*; but in the latter case the two divisions of the forked spines are both directed upwards, while in the former the chief prong is erect; the branch is strongly divergent.

#### Genus 4. HYSSURA.

HYSSURA PRODUCTA, n. sp. (Plate XXV. fig. v.)

General form very narrow and linear. Head rather outspread, flattened, shorter and somewhat wider than first peræon-segment; following segments slightly but gradually increasing in length to the fourth segment of the peræon, which is of about the same length as each of the two following; last segment two thirds the length of the penultimate. Pleon (fig. v. pl.), exclusive of telson, as long as the penultimate segment of the peræon; telson more than half that length. Pleon consisting of six distinct segments and a telson; first five segments furnished with a pair of pleopods fitted for swimming, sixth carrying two-branched uropods.

Upper antennæ with basal joint scarcely longer than broad, second and third subequal to each other, and rather shorter than first; flagellum three-jointed, not quite so long as the two last of peduncle. Lower antennæ (fig. v. c), as seen from above, closely approximated, their general appearance being very much those of *A. elongata*, bent outwards from the fourth joint, which is the longest; fifth half the length of fourth; flagellum of six articulations.

First gnathopods (fig. v. *gn*<sup>1</sup>) having basos and ischium strongly formed and of nearly the same length; meros short, produced on the back, and there forming a small simple cup with rounded base for the reception of the base of the hand; carpus minute, triangular, with a produced point, which carries a single seta projecting forwards over the base of the palm of the hand: hand twice as long as the united length of meros and carpus, and equal in length to the basal joint of the limb, resting on the carpus and fitting into the cup of the meros; it tapers gradually, the palm not defined, crenated, and bearing three or four spines; finger much curved, and rather shorter than that portion of the hand which projects beyond the carpus.

Second gnathopods and first peræopods, if anything, larger than the first, and of nearly similar form; but the carpus is more produced below, the lobe projecting over the palm being larger, and the palm of the hand is more strongly crenated than the first pair, the notches alternating with slender forked spines.

Third and fourth peræopods (fig. v. *prp*<sup>4</sup>) with the basos and ischium narrow; meros and carpus shorter and subequal to each other in length; the limb is greatly constricted at the junction of ischium and meros; meros very narrow at first, and widening distally;

carpus subquadrate; propodos rather longer than carpus, parallel-sided, with one infero-distal spine; dactylus large, longer than propodos, unguiculate.

The last segment of the peræon in the type specimen has no legs, nor can we see any sign of scars where they would have been attached, and the specimen was otherwise quite perfect.

Uropods (fig. v. pl.) with both branches narrowly lanceolate, equal-lengthed, and tipped with tufts of setæ; outer branch over the inner, very narrow, showing no tendency to arch over the back, as is usual in the genera *Anthura* and *Paranthura*, nearly parallel-sided, with a narrowly rounded apex; inner rather wider than outer, but also narrowly lanceolate, its inner margin straight, the outer margin sloping away near the apex to meet it; first joint short, second nearly three times its length.

Telson very narrow, elongate-lanceolate, apex acute and terminating in a little tuft of setæ, otherwise perfectly smooth and glabrous.

Length about a quarter of an inch; the form very narrow in proportion to its length.

A single specimen, dredged in the North Atlantic by H.M.S. 'Valorous' in 1875 (Station No. 11, lat. 56° 11' N., long. 37° 41' W., in 1450 fathoms.)

#### Genus 5. PARANTHURA.

##### 1. PARANTHURA NIGRO-PUNCTATA (Lucas). (Plate XXVI. fig. 11.)

1840. ? *Anthura gracilis*, M.-Edwards, Hist. des Crust. iii. p. 136, pl. xxxi. fig. 3 (probably; but not *A. gracilis*, Mont.).

1846. *Anthura nigropunctata*, Lucas, Explor. Scient. de l'Algérie, Anim. Artic. p. 64, pl. v. fig. 9.

1866. *Anthura nigro-punctata*, Heller, Verhandl. d. k.-k. zool.-botan. Gesellschaft in Wien, 1866, p. 732.

1866. *Paranthura costana*, Bate and Westwood, British Sessile-eyed Crust. ii. p. 165.

1870. *Paranthura costana*, Dohrn, Untersuchungen ü. Bau und Entw. der Arthropoden (erstes Heft), 1870, p. 91, pl. ix.

Peræon smooth above (neither keeled nor pitted), the first six segments subequal in length to each other; body narrowed at the hinder portion of the first and second peræon-segments; last segment about half the length of penultimate.

Pleon distinctly segmented, portion anterior to the telson equal to penultimate segment of peræon.

Telson linguiform. Uropods wide apart above, scarcely at all arching over telson; outer branch small, narrow, lanceolate, shorter than inner; inner as long as the telson, its second joint as long as the first; both telson and uropods are setose, especially at their terminations.

Eyes very distinct, black.

Antennæ: upper (fig. II. *a.s*) with joints of peduncle subequal in length; flagellum 5-6-jointed, equal in length to half the peduncle; lower (fig. II. *a.i*) strong, subpediform; flagellum reduced to a single articulation, which, however, is flattened, nearly as long as last joint of peduncle, and furnished along the side with a dense pencil of hairs.

Feet: all very like in form to the same members of *C. brachiata*; but the palm of the first gnathopods (II. *gn*<sup>1</sup>) is furnished with a small tubercular process at the base.

Length 13 millim.

*Habitat.* Coast of Algeria (*Lucas*); Adriatic (*Heller*!); Guernsey (*A. M. N.*!).

This species is at once distinguished from all the others known to us by the peculiar character of the flagellum of the lower antennæ, which consists of a single flattened joint, strongly ciliated along the edge.

We have had the opportunity of comparing Adriatic specimens kindly sent to us by Professor Heller, with the examples collected in Guernsey by A. M. N., and which were described by Bate and Westwood in their work.

Bate and Westwood have doubtfully referred the *Olisika penicillata* of Risso ('Crustacés de Nice,' 1816, p. 137, pl. iii. fig. 10, and 'Hist. Nat. Europ. Mérid.' v. p. 113) to this species; but *Olisika*, we think, cannot be synonymous with *Anthura*. The description of the telson ("sa queue est triangulaire, et terminée par deux long filets soyeux et penicillés") does not at all agree. Risso's genus must remain in obscurity until something like it shall have been rediscovered in the neighbourhood of Nice.

Another *Anthura* (*A. filiformis*) has been described and figured by Lucas ('Anim. Artic. de l'Algérie,' p. 63, pl. v. fig. 8) from the Algerian coast. It is characterized thus:—"A. fusco-ferruginea; capite parvo, utrinque sulcato, antice acuto; segmentis thoracis elongatis, angustis, profunde sulcatis, fortiter punctatis; abdomine elongato, segmento primo quinquescissurato, secundo angusto, fortiter carinato." The telson is linguiform and bears a central keel, the uropods are represented as very like in form to those of *A. nigro-punctata*, and the lower antennæ have a flagellum of about six articulations. It would seem to be a well-marked species.

Grube has described another Mediterranean *Anthura*, found at Cherso, under the name of *A. laurentiana* ('Ein Ausflug nach Triest und den Quarnern,' 1861, p. 138). In 'Die Insel Lussin und ihre Meeresfauna,' 1864, p. 76, the same author has recorded *A. gracilis* from the Adriatic; but since he specially refers to M. Edwards's figure, we may conclude that the species named by him is not *A. gracilis*. On the other hand, his description of *A. laurentiana* agrees very fairly with that of the true *A. gracilis*, except the important character "*corpus subteres . . . dorso haud sculpto*."

2. *PARANTHURA TENUIS*, G. O. Sars. (Plate XXVII. fig. 1.)

1872. *Paranthura tenuis*, G. O. Sars, Bidrag til Kundskaben om Dyrelivet paa vore Havbanken, Vidensk. Selsk. Forhandl. 1872, p. 89.

Head with the sides scarcely convex, almost parallel. Peræon with three first segments strongly keeled below; back of all the segments perfectly smooth; second segment contracted as usual behind, but only slightly so; last two thirds the length of the penultimate. Pleon (i. pl. D) well developed, and its segmentation distinct, as long as the penultimate segment of peræon.

Antennæ (i. a.s & i. a.i) short and thick, not longer than the head; peduncles of both pairs stout and strong, and their flagella very minute, about equal in length to the last joint of peduncle.

First gnathopods (i. gn<sup>1</sup>) stout and strong; basos very thick, not twice as long as broad; ischium slightly longer; meros produced anteriorly as usual to form a cup for the reception of the base of the hand, the bottom of the cup free from any appearance of angularity; wrist very minute; hand subtriangular, palm furnished with a small, tubercular, thumb-like projection at the proximal angle, and is margined with spines; finger strong, curved, equal in length to the palm. The hinder pairs of peræopods (i. pp<sup>4</sup>) have the basos subequal to the ischium, neither of these joints being more than three times as long as broad; meros subtriangular, rather more than half as long as ischium; wrist triangular, minute, so small that the hand and meros meet behind it; hand long-ovate, three to four times as long as broad, anteriorly furnished with three equal spines; these spines have a cilium springing from their side, and there is a similar cilium-furnished spine on the wrist; finger curved, as long as the hand.

Telson (i. pl. D) broadly spear-shaped. Uropods with the outer and upper branch short, but very wide, so that combined they form a complete dome overhanging the telson; inner branch long, narrow-lanceolate, projecting considerably beyond the telson, terminating in a bunch of long setæ.

Length 14 millim.

One specimen from the 'Porcupine' Expedition, 1870 (Station 22, off Lisbon, lat. 38° 15' N., long. 9° 33' W., in 718 fathoms).

Professor G. O. Sars has kindly sent us one of his type specimens, taken in 150-200 fathoms off the Island of Hvitingsoc, near Bergen, in Norway. This specimen, which is very small (6 millim.) closely agrees with the 'Porcupine' example, except that the thumb-like tubercular process of the palm of the hand is more developed.

Genus 6. *CALATHURA*.*CALATHURA BRACHIATA* (Stimpson). (Plate XXVI. fig. 1.)

1854. *Anthura brachiata*, Stimpson, Marine Invertebrata Grand Manan, p. 43; 1873. S. I. Smith, United States Fish and Fisheries Report (Invertebrate Animals of Vineyard Sound), p. 573.

1872. *Paranthura norvegica*, G. O. Sars, Bidrag til Kundskaben om Dyrelivet paa vore Havbanken, Vidensk. Selsk. Forhandl. 1872, p. 88.

1875. *Anthura arctica*, Heller, Crustaceen, Pycnogoniden und Tunicaten der k.-k. Österr. Ungar. Nordpol Expedit. p. 14, pl. iv. figs. 9-12; 1876. G. O. Sars, Prodrom. descrip. Crust. et Pycnogon. in exped. Norveg. 1876, in Archiv for Mathemat. og Naturvidenskab, p. 347.

Peræon having each of the five first segments nearly or quite twice as long as broad, slightly carinated on each side above; three first strongly keeled below, first of equal breadth throughout, second greatly constricted behind, so that here is the narrowest part of the whole body; third, fourth, and fifth segments gradually but only slightly widening, and with the last of these the body attains its greatest diameter; anterior margin of third segment slightly four-lobed, the lateral lobes produced outwards as small protuberances; fourth, fifth, and sixth segments with a central longitudinal dorsal impression anteriorly; last segment of peræon short, about one third the length of the penultimate.

Pleon very short, the whole (exclusive of telson) scarcely equalling the length of the penultimate segment of the peræon, but with the segments clearly distinguishable.

Both pairs of antennæ with the joints of their peduncles rounded, last joint of peduncle of inferior pair twice as long as the third; flagella of both pairs multiarticulate.

First gnathopods (fig. 1. *gn*<sup>1</sup>) strong; the hand large, ovate or somewhat triangular, united by the lower part of its base to the little wrist, and with the proximo-dorsal portion produced backwards into a large rounded lobe, which is received into a socket formed by the concave rounded lobe developed on the meros; palm occupying the entire length of the lower margin of the hand, slightly concave, edged with spines, each of which is found, when examined with a high power, to be itself margined with very minute spinules and to be tipped with a cilium.

Second gnathopods (fig. 1. *gn*<sup>2</sup>) and first peræopods of nearly similar form to the first, but more slender, and the lobe at the base of the hand much less developed.

The hinder peræopods are longer and more slender (fig. 1. *pp*<sup>4</sup>), not subchelate; hand and finger long and slender, subequal to each other, and each two to three times as long as the wrist; front margin of hand edged with fine down, and furnished with about six spines set at equal distances; these spines are themselves spined on the edge.

Uropods (fig. 1. *U*. D) with the outer plate, which arches over the telson, short and wide, much broader than long, and somewhat retuse, with a minutely dentated margin; inner plate much longer, subequal to the telson, sharply keeled on the underside; the second joint ovate and much shorter than the first, the inner margin smooth or very slightly crenulated.

The telson is shortly spear-shaped, the apex rather blunt.

Length of a large specimen one inch and an eighth, this being the largest known species of the family.



The type specimen of *C. brachiata* was dredged by Stimpson "on a shelly and somewhat muddy bottom in 20 fathoms, off the northern point of Duck Island, New Brunswick." We have been favoured with specimens by Mr. Whiteaves which were dredged in 200 fathoms in the Gulf of St. Lawrence; with others from Mr. S. I. Smith, which were procured in the Bay of Fundy; with a type specimen of *Paranthura norvegica* from Professor G. O. Sars, which was dredged in 150-200 fathoms near Stadanger, in Norway; and the same kind friend has also sent us one of the "*Paranthura arctica*" dredged by the 'Vöringer' in 1876 (Station 48; lat. 64° 36' N., long. 10° 21' W.), in 299 fathoms.

It was taken in many of the dredgings of the 'Porcupine' expedition:—

1869.—Station 30,	lat. 56° 24' N.,	long. 11° 49' W.,	1360 fathoms.
„ 36,	„ 48° 50' N.,	„ 11° 9' W.,	725 „
„ 47,	„ 59° 34' N.,	„ 7° 18' W.,	542 „
„ 65,	„ 61° 10' N.,	„ 2° 21' W.,	345 „
„ 88,	„ 59° 26' N.,	„ 8° 23' W.,	705 „
1870.—Station 1,	„ 48° 38' N.,	„ 10° 15' W.,	567 „

*Calathura brachiata* has thus been traced from the east coast of America, across the Atlantic, between Shetland and Faroe, off Norway, Scotland, and Ireland, and between the south of England and the Bay of Biscay.

It may always be at once distinguished by the impressed marks on the fourth and two following segments of the peræon and the form of telson and uropods.

#### POSTSCRIPT, June 1, 1886.

The foregoing paper was sent to the Society in the autumn of 1884: since that time some important papers on the Isopoda Chelifera have been published.

1. C. Claus, "Ueber *Apeudes latreillii*, Edw., und die Tanaiden" ('Arbeiten aus dem zool. Inst. der Univ. Wien und der zool. Stat. in Triest,' Tom. v. Heft iii., 1884). This is a morphological paper dealing with the general structure of the body and its limbs. The species on which the observations are based is called *Apeudes latreillii*, Edw. It is certainly not that species as understood by other authors, and comes nearest to *A. acutifrons*, G. O. Sars. It, however, is distinguished from *A. acutifrons* in the rostrum being rather wider at the base, the ocular alæ of quite another form, wider and larger, and containing conspicuous eyes, and in slight differences in the lower antennæ and other parts. The second gnathopods are altogether different, the front margin of the wrist being furnished with three, and that of the hand with six large spines. We would suggest the name *Apeudes hastifrons* for this form.

2. G. O. Sars, 'Den Norske Nordhavs-Exped. 1876-8; XIV. Zoologi; Crustacea, I.,' 1885. In this admirable work the author fully describes and illustrates the following species:—*Sphyrapus serratus*, G. O. Sars; *Leptognathia longiremis*, G. O. Sars; *Typhlotanaïs cornutus*, G. O. Sars; and

*Cryptocope vöringii*, G. O. Sars; which he had previously briefly characterized, and which have been referred to in the foregoing memoir.

3. Lastly, we have this day received from the author a copy of Professor Sars's latest work, 'Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna.—III. Middelhavets Saxisopoder (Isopoda Chelifera),' 1886. The Mediterranean Chelifera, which had been first made known in his 'Revision af Gruppen Isopoda Chelifera' (1880), and already mentioned by us, are here fully described and illustrated in fifteen plates.

The description and figures given in this work enable us to say positively that the *Aapseudes* which we have described under the name *lunarifrons*, and which we doubtfully referred to *A. echinatus*, G. O. Sars, is that species, and our own name must consequently give place to the earlier one of Prof. Sars.

Prof. G. O. Sars makes it a character of the genus *Sphyrapus* that the second gnathopods are not furnished with a palp, such as is present in *Aapseudes*; but our own observations do not agree with his, inasmuch as in the type species *Sphyrapus malleolus*, and also in *S. tudes*, a palp is unquestionably present on this limb.

## EXPLANATION OF THE PLATES.

### PLATE XVI.

i. D.	<i>Aapseudes latreillii</i> (M.-Edwards), viewed dorsally.		
L, ♂.	"	"	male, viewed laterally.
a.s.	"	"	upper antenna.
a.i.	"	"	lower antenna.
m.	"	"	mandibles.
mx <sup>1</sup> .	"	"	first maxilla.
map.	"	"	maxilliped.
gn <sup>1</sup> ♂.	"	"	first gnathopod, male.
gn <sup>1</sup> ♀.	"	"	first gnathopod, female.
gn <sup>2</sup> .	"	"	second gnathopod.
prp <sup>3</sup> .	"	"	third peræopod.
prp <sup>5</sup> .	"	"	last peræopod.
plp.	"	"	pleopod.
Pl. V.	"	"	pleon, viewed from below.

### PLATE XVII.

i. D.	<i>Aapseudes spinosus</i> , M. Sars, female, viewed from above.		
L.	"	"	side view of carapace and gnathopods of male.
a.i.	"	"	lower antenna.
gn <sup>1</sup> .	"	"	hand of first gnathopods of male.
prp <sup>3</sup> .	"	"	third peræopod, extremity.

I. D.	<i>prp</i> <sup>5</sup> .	<i>Apseudes spinosus</i> , M. Sars, female, last peræopod.
	Pl.*.	"          "          lateral process of segments of pleon.
II. D. L.	<i>Apseudes lunarifrons</i> , n. sp., dorso-lateral view, female.	
	C.	"          "          front of carapace, seen from above.
	C. L.	"          "          part of carapace, seen from the side, to show the mouth-organs.
	<i>gn</i> <sup>1</sup> .	"          "          first gnathopod.
	<i>prp</i> <sup>1</sup> .	"          "          first peræopod.
	<i>prp</i> <sup>3</sup> .	"          "          third peræopod.
	<i>prp</i> <sup>5</sup> .	"          "          last peræopod.

## PLATE XVIII.

I. L.	<i>Apseudes simplicirostris</i> , n. sp., seen from the side.	
	D.	"          "          head and peræon from above.
	<i>m</i> .	"          "          palp of the mandible.
	<i>a.i.</i>	"          "          scale of the lower antenna.
	<i>gn</i> <sup>1</sup> .	"          "          first gnathopod from the inner side.
	<i>gn</i> <sup>1*</sup> .	"          "          finger and thumb, more magnified.
	<i>gn</i> <sup>1**</sup> .	"          "          palp of the first gnathopod.
	<i>gn</i> <sup>2</sup> .	"          "          hand and finger of second gnathopod.
	<i>gn</i> <sup>2*</sup> .	"          "          palp of the second gnathopod.
	<i>prp</i> <sup>5</sup> .	"          "          termination of last peræopod.
	<i>prp</i> <sup>3</sup> .	"          "          abnormal growth of a third peræopod.
II. D.	<i>Apseudes obtusifrons</i> , n. sp., seen from above.	
	L.	"          "          seen from the side.
	C. L.	"          "          one side of the carapace seen from below.
	<i>o.c.</i>	"          "          the ocular process seen from above.
	<i>gn</i> <sup>1</sup> .	"          "          first gnathopod.
	<i>gn</i> <sup>2</sup> .	"          "          second gnathopod.
	<i>prp</i> <sup>5</sup> .	"          "          the last peræopod.

## PLATE XIX.

I. L.	<i>Apseudes grossimanus</i> , Norman, male, seen from the side.	
	C.	"          "          carapace seen from above.
	<i>a.s.</i>	"          "          peduncle of upper antenna.
	<i>l.</i>	"          "          labium.
	<i>m.</i>	"          "          mandibles.
	<i>mx</i> <sup>1</sup> .	"          "          first maxilla.

i. <i>mx</i> <sup>2</sup> .	<i>Apseudes grossimanus</i> , Norman,	second maxilla and setæ, more highly magnified.
<i>mxp</i> .	„ „	maxilliped, and inner margin more highly magnified.
<i>gn</i> <sup>1</sup> ♀.	„ „	first gnathopod, female, and inner margin of thumb greatly magnified.
<i>gn</i> <sup>2</sup> .	„ „	second gnathopod, finger, and peculiar spine, highly magnified.
<i>prp</i> <sup>5</sup> .	„ „	last legs, with hand and its hairs, more highly magnified.
<i>plp</i> .	„ „	pleopod.

## PLATE XX.

i. L.	<i>Apseudes gracilis</i> , n. sp.,	viewed laterally.
D.	„ „	anterior portion, from above.
Pl.	„ „	last segments of pleon.
<i>a.s.</i>	„ „	upper antenna.
<i>a.i.</i>	„ „	lower antenna.
<i>m.</i>	„ „	mandible.
<i>gn</i> <sup>1</sup> .	„ „	first gnathopod.
<i>gn</i> <sup>1*</sup> .	„ „	side view of mouth-organs, and an abnormally developed first gnathopod.
<i>gn</i> <sup>2</sup> .	„ „	second gnathopod.
<i>prp</i> <sup>5</sup> .	„ „	last peræopod.
<i>plp</i> .	„ „	pleopod.

## PLATE XXI.

i. D.	<i>Apseudes uncidigitatus</i> , n. sp.,	viewed dorsally.
L.	„ „	viewed laterally.
C.	„ „	carapace from above.
C. V*.	„ „	carapace from below.
<i>a.s.</i>	„ „	upper antenna.
<i>gn</i> <sup>1</sup> .	„ „	first gnathopod.
<i>gn</i> <sup>2</sup> .	„ „	second gnathopod.
<i>prp</i> <sup>1</sup> .	„ „	first peræopod.
<i>prp</i> <sup>2</sup> .	„ „	second peræopod.
<i>prp</i> <sup>3</sup> .	„ „	third peræopod.
<i>prp</i> <sup>4</sup> .	„ „	fourth peræopod.

I.	<i>prp</i> <sup>5</sup> .	<i>Apseudes uncidigitatus</i> , n. sp.,	fifth peræopod.
II.	L.	<i>Sphyrapus anomalus</i> (G. O. Sars),	viewed laterally.
	C.	" "	carapace from above, and end of rostrum, more highly magnified.
	<i>a.a.</i>	" "	upper and lower antennæ.
	<i>gn</i> <sup>1</sup> .	" "	first gnathopod.
	<i>gn</i> <sup>2</sup> .	" "	second gnathopod.
	<i>prp</i> <sup>5</sup> .	" "	last peræopod.
	<i>urp.</i>	" "	uropods.

## PLATE XXII.

I.	D.	<i>Sphyrapus tudes</i> , n. sp.,	dorsal view.
	L.	" "	lateral view.
	<i>a.a.</i>	" "	upper and lower antennæ, with eye-processes, seen from below.
	<i>m.</i>	" "	mandible.
	<i>mx.</i>	" "	maxilla.
	<i>maxp.</i>	" "	maxilliped.
	<i>gn</i> <sup>1</sup> .	" "	first gnathopod.
	<i>gn</i> <sup>2</sup> .	" "	second gnathopod.
	<i>prp</i> <sup>1</sup> .	" "	first peræopod.
	<i>prp</i> <sup>2</sup> .	" "	second peræopod.
	<i>prp</i> <sup>3</sup> .	" "	third peræopod.
	<i>prp</i> <sup>3*</sup> .	" "	third peræopod, hand, and dactylus, more highly magnified.
	<i>prp</i> <sup>4</sup> .	" "	fourth peræopod.
	<i>prp</i> <sup>4*</sup> .	" "	fourth peræopod, hand, and dactylus, more highly magnified.
	<i>prp</i> <sup>5</sup> .	" "	last peræopod.
	<i>prp</i> <sup>5*</sup> .	" "	last peræopod, hand, and dactylus, more highly magnified.
	<i>ur.</i>	" "	telson and uropods from below.
II.	D. L. ♂	<i>Sphyrapus malleolus</i> , n. sp.,	male, seen obliquely from above.
	<i>a.a.</i>	" "	antennæ, seen from below.
	<i>m.</i>	" "	mandible.
	<i>gn</i> <sup>1</sup> .	" "	first gnathopod.
	<i>gn</i> <sup>2</sup> .	" "	second gnathopod.
	<i>prp</i> <sup>1</sup> , <i>prp</i> <sup>2</sup> , <i>prp</i> <sup>3</sup> , <i>prp</i> <sup>5</sup> . }	" "	first, second, third, and last peræopods.

III. D. ♀.	<i>Sphyrapus malleolus</i> , n. sp.,	female, seen from above.	
Pl.	”	”	terminal segments of pleon, with pleopod and base of uropods, seen from the side.
<i>gn</i> <sup>1</sup> .	”	”	first gnathopod.
<i>gn</i> <sup>1*</sup> .	”	”	first gnathopod, a malformation or reproduction.

## PLATE XXIII.

I. D.	<i>Alaotanaïs serratispinosus</i> , n. sp.,	seen from above.	
L.	”	”	carapace viewed laterally.
<i>map</i> .	”	”	maxilliped.
<i>aa</i> .	”	”	antennæ of both pairs.
<i>gn</i> <sup>1</sup> .	”	”	first gnathopod.
<i>gn</i> <sup>1*</sup> .	”	”	finger and thumb of first gnathopod.
<i>gn</i> <sup>2</sup> .	”	”	propodos and dactylus of second gnathopod.
<i>prp</i> <sup>4</sup> .	”	”	fourth peræopod.
<i>prp</i> <sup>4*</sup> .	”	”	propodos and dactylus of fourth peræopod, highly magnified.
<i>plp</i> .	”	”	pleopod, seen from within.
<i>plp</i> <sup>*</sup> .	”	”	pleopod, from outer side.
T.	”	”	end of pleon, underpart viewed obliquely.
II. L.	<i>Alaotanaïs hastiger</i> , n. sp.,	seen from the side.	
C.	”	”	outline of carapace, from above.
C <sup>*</sup> .	”	”	portion of carapace, seen from the side, showing shape and position of the eye-process.
Pl.	”	”	pleon, viewed dorsally.
<i>gn</i> <sup>1</sup> .	”	”	thumb and finger of first gnathopod.
<i>prp</i> <sup>2</sup> .	”	”	second peræopod.
<i>prp</i> <sup>5</sup> .	”	”	last peræopods, terminal joints, viewed from the front.

## PLATE XXIV.

I. D.	<i>Alaotanaïs serratispinosus</i> , n. sp.,	dorsal view.	
Pl.	”	”	end of pleon, from above.
<i>gn</i> <sup>1</sup> .	”	”	first gnathopod, exterior lateral view.
II. L.	<i>Alaotanaïs lævispinosus</i> , n. sp.,	side view.	
D.	”	”	viewed from above.

II. aa.	<i>Alaotanaia laevispinosus</i> , n. sp.,	antennæ, inner faces.
<i>mxp.</i>	”	” half of maxilliped.
<i>gn</i> <sup>1</sup> .	”	” hand and finger of first gnathopod.
<i>gn</i> <sup>2</sup> .	”	” second gnathopod.
<i>prp</i> <sup>5</sup> .	”	” last peræopod.
<i>plp.</i>	”	” pleopod.
<i>urp.</i>	”	” terminal segment of pleon, and portion of uropod.
III. D.	<i>Strongylura arcetophylax</i> , n. sp.,	seen from above.
<i>a.s.</i>	”	” upper antenna.
<i>a.i.</i>	”	” lower antenna.
<i>gn</i> <sup>1</sup> .	”	” first gnathopod.
<i>gn</i> <sup>2</sup> .	”	” second gnathopod.
<i>prp</i> <sup>4</sup> .	”	” fourth peræopod.
Pl.	”	” pleon, underside.
Pl*.	”	” end of pleon, viewed laterally.
IV. D.	<i>Tanaella unguicillata</i> , n. sp.,	seen from above.
L.	”	” seen from the side.
L*.	”	” carapace, more magnified, seen from the side.
Pl.	”	” underside of pleon and uropods.
<i>prp</i> <sup>1</sup> .	”	” end of first peræopod.
<i>prp</i> <sup>3</sup> .	”	” fourth peræopod.

## PLATE XXV.

I. D, ♂.	<i>Anthelura elongata</i> (Norman),	viewed dorsally (male).
C, ♂.	”	” head of male, with antennæ and first segment of peræon.
<i>gn</i> <sup>1</sup> .	”	” first gnathopod, outer side.
<i>gn</i> <sup>1*</sup> .	”	” first gnathopod, terminal portion of the same, inner side.
<i>gn</i> <sup>2</sup> .	”	” second gnathopod.
<i>prp</i> <sup>1</sup> .	”	” first peræopod.
<i>prp</i> <sup>4</sup> .	”	” fourth peræopod.
<i>prp</i> <sup>5</sup> .	”	” fifth peræopod, terminal joints.
C, L.	”	” lateral view of head, with mouth-organs and basal joints of antennæ.
Pl. L, ♂.	”	” pleon, seen from the side.
Pl. D, ♂.	”	” pleon, seen from above.

II. C, ♀ .	<i>Anthelura elongata</i> (Norman)	(female), head with antennæ, seen from above.
Pl. ♀ .	"    "	(female), pleon, seen from above.
III. D, ♂ .	<i>Anthura gracilis</i> (Montagu),	male, viewed dorsally.
Pl. V, ♂ .	"    "	"    pleon, seen from below.
IV. gn <sup>1</sup> ♀ .	"    "	female, first gnathopod.
V. D.	<i>Hyssura producta</i> , n. sp.,	seen from above.
C.	"    "	head and antennæ.
gn <sup>1</sup> .	"    "	first gnathopod.
prp <sup>4</sup> .	"    "	fourth peræopod.
Pl.	"    "	pleon, viewed dorso-laterally.

## PLATE XXVI.

I. D, ♀ .	<i>Calathura brachiata</i> (Stimpson),	female, from above.
a.s.	"    "	upper antenna.
a.i.	"    "	lower antenna.
m.	"    "	mandible.
lbr.	"    "	labrum (?).
lbi.	"    "	labium.
ma <sup>1</sup> .	"    "	first maxilla.
maxp.	"    "	maxillipeds.
gn <sup>1</sup> .	"    "	first gnathopod.
gn <sup>2</sup> .	"    "	second gnathopod.
prp <sup>4</sup> .	"    "	fourth peræopod.
plp <sup>1</sup> .	"    "	first pleopod.
plp <sup>2</sup> .	"    "	second pleopod.
Pl. D.	"    "	telson and uropods, from above.
Pl. V.	"    "	pleon, seen from below.
L, ♀ .	"    "	a female, natural size, viewed laterally.
II. D, ♀ .	<i>Paranthura nigro-punctata</i> (Lucas),	gravid female, from above.
a.s.	"    "	upper antenna.
a.i.	"    "	lower antenna.
gn <sup>1</sup> .	"    "	first gnathopod.
gn <sup>2</sup> .	"    "	second gnathopod.
prp <sup>1</sup> .	"    "	first peræopod.
prp <sup>4</sup> .	"    "	fourth peræopod.

## PLATE XXVII.

I. L.	<i>Paranthura tenuis</i> , G. O. Sars,	viewed laterally.
C, L.	"    "	head viewed laterally, and more magnified.



I. Pl. D.	<i>Paranthura tenuis</i> , G. O. Sars,	pleon, from above.
<i>a.s.</i>	"    "	upper antenna.
<i>a.i.</i>	"    "	lower antenna.
<i>gn</i> <sup>1</sup> .	"    "	first gnathopod.
<i>gn</i> <sup>2</sup> .	"    "	second gnathopod.
<i>prp</i> <sup>1</sup> .	"    "	first peræopod.
<i>prp</i> <sup>4</sup> .	"    "	fourth peræopod.
II. L.	<i>Anthelura abyssorum</i> , n. sp.,	side view.
C, D.	"    "	head, from above.
Pl. D.	"    "	pleon, from above.
Pl. L.	"    "	pleon, from the side.
<i>a.s.</i>	"    "	upper antenna.
<i>a.i.</i>	"    "	lower antenna.
<i>gn</i> <sup>1</sup> .	"    "	first gnathopod.
<i>gn</i> <sup>2</sup> .	"    "	second gnathopod.
<i>prp</i> <sup>5</sup> .	"    "	fifth peræopod.
III. <i>a.s.</i>	<i>Cyathura carinata</i> (Kröyer),	upper antennæ, with last joints more highly magnified.
<i>a.i.</i>	"    "	lower antennæ, with last joints more highly magnified.
<i>lb</i> <sub>i</sub> .	"    "	labium.
<i>m</i> .	"    "	mandible and palp.
<i>mx</i> <sup>1</sup> .	"    "	first maxilla, and termination more highly magnified.
<i>mxp</i> .	"    "	maxillipeds.
<i>gn</i> <sup>1</sup> .	"    "	first gnathopod.
Pl.	"    "	end of telson.